CBCS SCHEME

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18CV32

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Strength of Materials

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain longitudinal strain and lateral strain. **(04 Marks)**

b. State and illustrate Saint Venant's principle. **(06 Marks)**

c. A tension test was conducted on mild steel bar and the following data was obtained from the test:
Diameter of the bar = 18mm
Gauge length of the bar = 82mm
Load at proportional limit = 75KN
Extension at a load of 62KN = 0.113mm
Load at failure = 82KN
Final gauge length of the bar = 106mm
Diameter of the bar at failure = 14mm
Determine the Young's modulus, proportional limit, true breaking stress, %elongation and percentage reduction in cross sectional area. **(10 Marks)**

OR

2 a. What are the elastic constants and explain them briefly. **(06 Marks)**

b. Obtain expression for temperature stress in a bar of uniform cross section when expansion or contraction is prevented partially. **(04 Marks)**

c. A weight of 390KN is supported by a short column of 250mm square in section. The column is reinforced with 8 steel bars of cross sectional area 2500mm^2. Find the stresses in steel and concrete if $E_s=15E_c$.
If stress in concrete must not exceed 4.5MN/m^2, what area of steel is required in order that column may support a load of 480KN. **(10 Marks)**

Module-2

3 a. Derive Lame's equation for the radial and hoop stress for thick cylinder subjected to internal and external fluid pressure. **(08 Marks)**

b. A 2-dimensional element has the tensile stresses of 600MN/m^2 and compressive stress of 400MN/m^2 acting on two mutually perpendicular planes and two equal shear stresses of 200MN/m^2 on their planes. Determine
i) Resultant stress on a plane inclined at 30° wrt x-axis.
ii) The magnitude and direction of principal stresses.
iii) Magnitude and direction of maximum shear stress. **(12 Marks)**

OR

4 a. Obtain expression for volumetric strain in thin cylinder subjected to internal pressure in the form of $e_v=\frac{pd}{2tE}\left[\frac{5}{2}-\frac{2}{m}\right]$. **(08 Marks)**

b. A cast iron pipe has 200mm internal diameter and 50mm metal thickness and carries water under a pressure of 5N/mm^2. Calculate the maximum and minimum intensities of circumferential stresses and sketch the distribution of circumferential stress intensity and the intensity of radial pressure across the section. **(12 Marks)**

Module-3

5 a. Define shear force, bending moment and point of contraflexure. Explain how to calculate them? **(06 Marks)**

b. Develop shear force diagram and bending moment diagrams for the beam loaded shown in Fig. Q5(b) marking the values at salient points. Determine the position and magnitude of maximum bending moment.

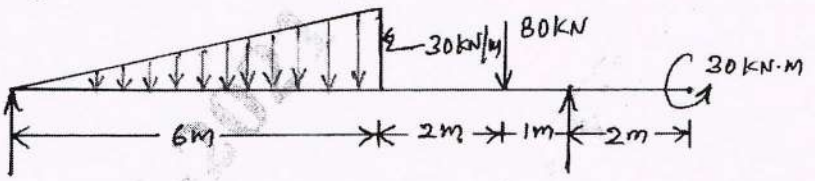

Fig. Q5(b) **(14 Marks)**

OR

6 a. Obtain the relationship between udl, shear force and bending moment. **(06 Marks)**

b. Construct SFD and BMD for the beam loaded shown in Fig. Q6(b). Also locate the point of contraflexure.

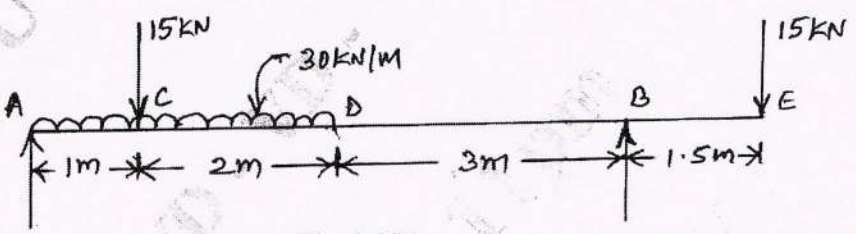

Fig.Q6(b) **(14 Marks)**

Module-4

7 a. Derive torsional equation with usual notations. **(06 Marks)**

b. A T-section of flange 120mm×12mm and overall depth 200mm with 12mm web thickness is loaded such that at a section it has a bending moment of 20KN.m and shear force of 120KN. Sketch the bending and shear stress distribution diagram marking the salient values. **(14 Marks)**

OR

8 a. Derive Bernoulli-Euler bending equation with usual notations. **(08 Marks)**

b. A solid circular shaft has to transmit power of 1000KW at 120rpm. Find the diameter of the shaft if the shear stress of the material is not to exceed 80N/mm^2. The maximum torque is 1.25 times the mean torque. What percentage saving in material could be obtained if the shaft is replaced by a hollow one whose internal diameter is 0.6 times the external diameter? The length of the shaft, material and maximum shear stress being same. **(12 Marks)**

Module-5

9 a. Define slope, deflection and elastic curve. Explain Macaulay's method of determining slope and deflection. **(10 Marks)**

b. Compare the crippling loads given by Euler's and Rankine's formula for a tubular steel column 2.5m long having outer and inner diameter as 40mm and 30mm respectively. The column is loaded through pin joints at the ends. Take permissible compressive stress as 320N/mm^2, Rankine constant as $\frac{1}{7500}$ and E=210GPa. For what length of the column of their cross section, does the Euler's formula cease to apply? **(10 Marks)**

OR

10 a. Differentiate between short and long column and what are the limitations of Euler's theory. **(06 Marks)**

b. Calculate slope at A and deflection at D for the overhanging beam shown in Fig. Q10(b). Take E = 200GPa and I = $50\times10^6 mm^4$. **(14 Marks)**

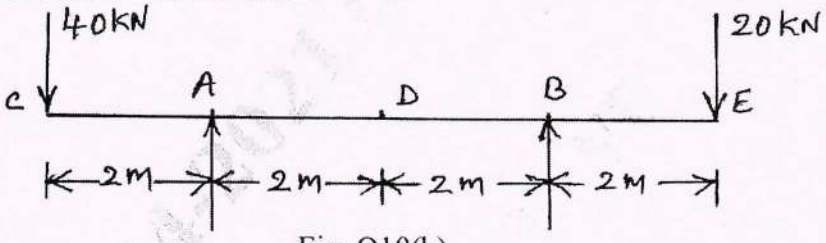

Fig. Q10(b).

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CBCS SCHEME

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18CV33

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Fluid Mechanics

Time: 3 hrs. Max. Marks: 100

Note: **1.** ***Answer any FIVE full questions, choosing ONE full question from each module.***
2. ***Assume missing data (if any) suitably.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Define the following and mention their units:
(i) Capillarity (ii) Surface tension (iii) Viscosity **(06 Marks)**

b. Derive an expression for capillary rise/fall of fluid in a tube of small diameter with sketches. **(06 Marks)**

c. A 100 mm diameter cylinder rotates concentrically inside a 105 mm diameter fixed cylinder. The length of both the cylinders is 250 mm. find the viscosity of the liquid that fills the space between the cylinders, if a torque of 1.0 N-m is required to maintain a rotating speed of 120 rpm. **(08 Marks)**

OR

2 a. State and prove Pascal's law for the intensity of pressure at a point in a static fluid. **(06 Marks)**

b. Derive an expression for difference in pressure between two points using a U-tube differential manometer. **(08 Marks)**

c. Determine the pressure intensity at the bottom of a tank filed with an oil of specific gravity 0.7 to a height of 10 m. **(06 Marks)**

Module-2

3 a. Define: (i) Total pressure (ii) Center of pressure **(04 Marks)**

b. Derive an expression for total pressure and center of pressure for an inclined plane surface submerged in a liquid. **(08 Marks)**

c. A 1200 mm × 1800 mm size rectangular plate is immersed in water with an inclination of 30° to the horizontal. The 1200 mm side of the plate is kept horizontal at a depth of 30 m below the water surface. Compute the total pressure on the surface and the position of center of pressure. **(08 Marks)**

OR

4 a. Differentiate between:
(i) Uniform and non-uniform flow
(ii) Steady and unsteady flow **(04 Marks)**

b. Derive continuity equation for a three dimensional flow in Cartesian coordinates. **(08 Marks)**

c. Evaluate stream function ψ and compute velocity of flow, V, for a two-dimensional flow field given by, $u = 4x^3$ and $v = -12x^2y$ at point (1, 2). Assume $\psi = 0$ at point (0, 0). **(08 Marks)**

Module-3

5 a. State Impulse Momentum principle. Give fields where it is applied. **(04 Marks)**

b. Derive an expression for force exerted by a fluid on a pipe bend. **(08 Marks)**

c. A pipe of 300 mm diameter, carrying 15000 litres per minute of water is bent by 135°. Find the magnitude and direction of resultant force exerted by the flowing fluid on the bend if the pressure of the flowing water is 39.24 N/cm^2. **(08 Marks)**

OR

6 a. What is venture effect? Derive an expression for discharge through a venturimeter. **(08 Marks)**

b. A pitot tube fixed in a pipe of 300 mm diameter is used to measure the velocity and rate of flow. If the stagnation and static pressure heads are 6.0 m and 5.0 m respectively, compute the velocity and rate of flow. Assume $C_V = 0.98$ for the pitot tube. **(06 Marks)**

c. A 20 cm × 10 cm venturimeter is used to measure the flow of water in a horizontal pipe. The pressure at the inlet of venturimeter is 17.658 N/cm^2 and the vacuum pressure at the throat is 30 cm of mercury. Find the discharge of water through the venturimeter assuming $C_d = 0.98$. **(06 Marks)**

Module-4

7 a. Define hydraulic coefficients for an orifice and give the relation between them. **(06 Marks)**

b. Give classification of mouth pieces with suitable sketches. **(06 Marks)**

c. A jet of water issuing from an orifice 25 mm diameter under a constant head of 1.50 m, falls 0.915 m vertically before it strikes the ground at a horizontal distance of 2.288 m from vena-contracta. The discharge is found to be 102 litres per minute. Calculate the hydraulic coefficients of the orifice. **(08 Marks)**

OR

8 a. Enumerate advantages of triangular notches over rectangular notches. **(04 Marks)**

b. Derive the expression for discharge through a triangular notch. **(08 Marks)**

c. A river 60 m wide has vertical banks and 1.50 m depth of flow. The velocity of flow is 1.20 m/s. A broad crested weir 2.40 m high is constructed across the river. Find the head on the weir crest considering the velocity of approach. Assume $C_d = 0.90$. **(08 Marks)**

Module-5

9 a. Derive Darcy-Weisbach equation for head loss due to friction in a pipe. **(08 Marks)**

b. List major and minor losses in a pipe flow. **(04 Marks)**

c. Water is required to be supplied to a colony of 4000 residents at a rate of 180 lires per person from a source 3 km away. If half the daily requirement needs to be pumped in 8 hours against a friction head of 18 m, find the size of the main pipe supplying water. Assume friction factor as 0.028. **(08 Marks)**

OR

10 a. What is an equivalent pipe? Derive an expression for diameter of an equivalent pipe. **(08 Marks)**

b. Explain phenomenon of water hammer in pipes. **(04 Marks)**

c. Water is flowing in a pipe of 150 mm diameter with a velocity of 2.5 m/s, when it is suddenly brought to rest by closing the valve. Find the pressure rise in the pipe assuming it to be elastic with E = 206 GN/m^2 and Poisson's ration = 0.25. The bulk modulus of water, K = 206 GN/m^2. Thickness of pipe wall is 5 mm. **(08 Marks)**

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CBCS SCHEME

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18CV34

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Building Materials and Construction

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. What are the factors that cause deterioration of stones and explain the methods commonly adopted to preserve the stones. **(08 Marks)**

b. Briefly explain the various field and laboratory tests conducted on bricks to find its suitability for construction. **(08 Marks)**

c. What are the advantages of cement concrete blocks? **(04 Marks)**

OR

2 a. Lists the tests conducted on fine aggregates and explain any one of them in detail. **(08 Marks)**

b. Explain impact and abrasion tests conducted on coarse aggregates. **(08 Marks)**

c. What are the characteristics of good timber used for construction? **(04 Marks)**

Module-2

3 a. What are the functions of a foundation? Mention the situations during which pile foundations are adopted. **(08 Marks)**

b. Write a note on:
i) Spread footing ii) Strap footing **(08 Marks)**

c. Write the advantages of cavity walls. **(04 Marks)**

OR

4 a. Sketch the elevation of a brick wall built in i) English bond ii) Flemish bond. Compare the merits and demerits of English bond and Flemish bond. **(08 Marks)**

b. Write a note on classification of stone masonry. **(08 Marks)**

c. Write a note on partitions walls. **(04 Marks)**

Module-3

5 a. Draw a neat sketch of an arch and explain the technical terms used. **(08 Marks)**

b. Explain i) Chejja ii) Canopy iii) Balcony iv) Lintel. **(08 Marks)**

c. Write a note on stability of arch. **(04 Marks)**

OR

6 a. List the types of flooring and explain the method of laying of cement concrete flooring in detail. **(08 Marks)**

b. List the classification of pitched roof. With neat sketches explain any two of them. **(08 Marks)**

c. What are the factors to be considered while selecting a roof covering? **(04 Marks)**

Module-4

7 a. With the help of a neat sketch explain
i) Paneled door ii) Collapsible door. **(08 Marks)**

b. Write a note on
i) Bay window ii) Steel window **(08 Marks)**

c. What are the guidelines to be followed while locating doors and windows? **(04 Marks)**

OR

8 a. Write a note on
i) Shoring ii) Underpinning. **(08 Marks)**

b. Plan a dogged stair for a building in which vertical distance between the floors is 3.6m. The stair hall measures 2.8m×5.0m (internal dimension). **(08 Marks)**

c. With the help of a neat sketch explain
i) Tread and Riser ii) Flight and Landing. **(04 Marks)**

Module-5

9 a. What are the objectives of plastering? Explain the defects in plastering. **(10 Marks)**

b. Briefly explain the methods of damp proofing. **(10 Marks)**

OR

10 a. Explain the method of laying stucco plastering and lathe plastering. **(10 Marks)**

b. Explain the constituents of a paint and explain the procedure of painting on new wood works. **(10 Marks)**

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CBCS SCHEME

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18CV35

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Basic Surveying

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Define surveying. Discuss the classification of surveying. **(10 Marks)**

b. What is ranging? Explain the indirect method for ranging with neat sketch. **(08 Marks)**

c. What is well conditioned triangle? **(02 Marks)**

OR

2 a. Write short notes on optical square and prism square. **(06 Marks)**

b. A big pond obstructs the chain line such that P and T are on the opposite sides of a pond and line PQ and PR were selected on the left hand side and Right hand side respectively. So that point Q, T and R were in straight line. Find length PT. Take PQ 150m, PR = 230m, QT = 75m, RT = 100m. **(08 Marks)**

c. Explain briefly chains on slopping ground by stepping method. **(06 Marks)**

Module-2

3 a. Differentiate between :
i) True meridian and magnetic meridian ii) Dip and declination iii) Agonic and isogonic lines. **(06 Marks)**

b. The following bearings were observed with compass. Calculate the interior angles and draw rough diagram.

Line	AB	BC	CD	DE	EA
Bearing	60°30′	122°0′	46°0′	205°30′	300°

(08 Marks)

c. What is local attraction? How it is detected and eliminated? Also give the reason for it. **(06 Marks)**

OR

4 a. What is traversing? What are the different types of traversing? **(04 Marks)**

b. What is closing error? Explain the Bowditch rule of graphical adjustment with sketch. **(08 Marks)**

c. Following are the observed length and bearings of the lines of a closed traverse ABCDEA. The length and bearing of line EA emitted, calculate it.

Line	Length (m)	Bearings
AB	204	87°30′
BC	226	20°20′
CD	187	280°0′
DE	192	210°30′
EA	?	?

(08 Marks)

Module-3

5 a. Explain the following terms. i) Elevation ii) Benchmark iii) Datum iv) Mean sea level. **(04 Marks)**

b. What do you understand by balancing of sight? With figure explain how the errors are eliminated. **(06 Marks)**

c. The following is the page of a level book. Find out the missing reading(X) and complete the level book. Apply usual arithmetical check.

Sl.No.	BS	IS	FS	HI	RL	Remark
1	4.000			X	X	
2		X			195.935	
3	2.150		3.995	X	X	
4		2.415			195.240	BM
5		1.665			X	
6		X			200.770	
7	3.610		X	X	X	
8			1.715		196.985	

(10 Marks)

OR

6 a. Write short notes on : i) Curvature and Refraction error ii) Borometric leveling and fly leveling iii) Collimation error and hypsometry. **(06 Marks)**

b. Describe the procedure for reciprocal leveling with neat sketch. **(06 Marks)**

c. The following observations were taken in reciprocal leveling. Determine the R.L of B if that of A is 100.150m. Also calculate the collimation error if AB = 1000m.

Inst. Station	Staff reading	
	A	B
A	1.625	2.545
B	0.725	1.405

(08 Marks)

Module-4

7 a. Describe briefly radiation method and intersection method of plane tabling. **(10 Marks)**

b. Define two point problem. Explain the graphical method of solution of two point problem with figure. **(10 Marks)**

OR

8 a. Write short notes on :i) Orientation of plane table ii) Triangle of error iii) Alidade. **(06 Marks)**

b. Discuss the temporary adjustments of plane table. **(06 Marks)**

c. What are the advantages and disadvantages of plane table? **(08 Marks)**

Module-5

9 a. What is contour? What are the uses of contour lines? **(08 Marks)**

b. A road embankment is 11m wide at the formation level and has side slope 1 : 2(V : H). The ground level at every 80m along centre line are shown in table. The formation level at zero chainage is 123.0 and embankment having a rising gradient 1 : 100 calculate the volume of earthwork by trapezoidal and primordial rule.

Dist.	0	80	160	240	320
RL	120.8	122.5	123.4	123.8	124.5

(12 Marks)

OR

10 a. Define the following terms : i) Contour interval ii) Interpolation of contour iii) Horizontal equivalent v) Contour gradient. **(04 Marks)**

b. What is planimeter? Explain the polar planimeter along with essential parts. **(12 Marks)**

c. Determine the area of plan from following data. Needle point out side plan. Zero of dial passed index mark once in clockwise direction : Initial reading = 8.364
Final reading = 4.234. **(04 Marks)**

CBCS SCHEME

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18CV36

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Engineering Geology

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Discuss in brief different branches of Geology, which are related to Civil Engineering. **(04 Marks)**

b. Briefly explain the internal structure of the earth based on different unconformities and add a note on its composition. **(08 Marks)**

c. Explain the role of Geology in the field of Civil Engineering. **(08 Marks)**

OR

2 a. What is Mineral? Describe the following Physical properties of a Mineral.
i) FORM ii) Hardness iii) Fracture. **(06 Marks)**

b. Explain the primary structures in Sedimentary rocks, with neat sketches. **(08 Marks)**

c. Write a note on Soil profile. **(06 Marks)**

Module-2

3 a. What are Folds? How are they caused? Discuss the various types of folds in rock and influences on Civil Engineering. **(15 Marks)**

b. What is Normal Fault? Add a note on Horst and Graben, with neat sketches. **(05 Marks)**

OR

4 a. What is Weathering? Describe Physical and Mechanical weathering. **(10 Marks)**

b. Explain Railway ballast with examples. **(05 Marks)**

c. Write notes on causes of Landslides. **(05 Marks)**

Module-3

5 a. What is an Out Crop? Describe the terms strike and DIP, with a neat sketch. **(08 Marks)**

b. Explain Floods, causes and its control. **(06 Marks)**

c. Write a note on Tunneling through the fold axis of an Antidine. **(06 Marks)**

OR

6 a. Briefly explain Exogeneous and Endogeneous geological events. **(06 Marks)**

b. Describe the different drainage patterns of a River basin, with neat sketches. **(08 Marks)**

c. Briefly explain Extrusive and Intrusive forms of Igneous rocks. **(06 Marks)**

Module-4

7 a. Explain the Electrical resistivity method for exploration of ground water. **(08 Marks)**

b. Explain how the quality of ground water can be determined by SAR , RSC , GTH. **(04 Marks)**

c. Explain how Artificial recharge of ground water can be made. **(08 Marks)**

OR

8 a. Describe with a neat diagram, Vertical distribution of Ground water. **(10 Marks)**

b. Write a brief note on Land forms. **(10 Marks)**

Module-5

9 a. What is an Earth Quake? Describe the Tectonic causes of Earthquake and its effects. (08 Marks)

b. Explain Aquifer and its types. (06 Marks)

c. Write a note on Specific Yield and Specific Retention. (06 Marks)

OR

10 a. What is Remote Sensing? Write its application in Civil Engineering. (08 Marks)

b. What is GIS? Name the different components of GIS. (06 Marks)

c. Write an application on Global Positioning System (GPS) in Civil Engineering. (06 Marks)

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CBCS SCHEME

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17CV/CT32

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Strength of Materials

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define: (i) Young's modulus (ii) Bulk modulus (iii) Poisson's ratio. Derive a relationship between them. **(10 Marks)**

b. Two solid cylindrical rods are connected and loaded as shown in Fig.Q1(b). Determine: (i) Total deformation (ii) Deformation at point B. E_S = 200 GPa, E_b = 100 GPa.

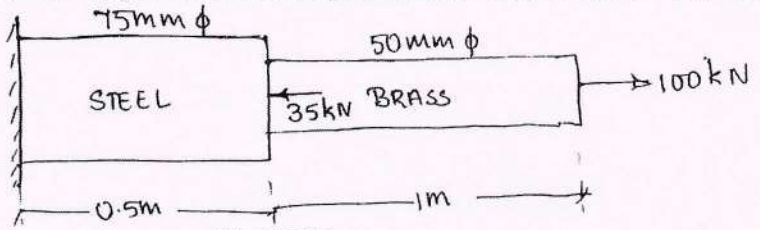

Fig.Q1(b) **(10 Marks)**

OR

2 a. A compound bar made of steel plate 60 mm wide and 10 mm thick to which a copper plate 60 mm wide and 5 mm thick are rigidly connected to each other. The length of the bar is 0.7 m. If the temperature is raised by 80°C. Determine the stress in each metal and the change in length.

E_S = 200 GPa, $\alpha_S = 12 \times 10^{-6}$/°C ; E_{cu} = 100 GPa, $\alpha_{cu} = 17 \times 10^{-6}$/°C **(12 Marks)**

b. Derive an expression for extension of the bar due to its self weight only having area 'A' and length L suspended from its top. **(04 Marks)**

c. Write a note on thermal stresses. **(04 Marks)**

Module-2

3 a. At a certain point in a strained material the stress condition shown in Fig.Q3(a) exists. Find:
(i) The normal and shear stress on the inclined plane AB
(ii) Principal stresses and principal planes
(iii) Maximum shear stresses and their planes

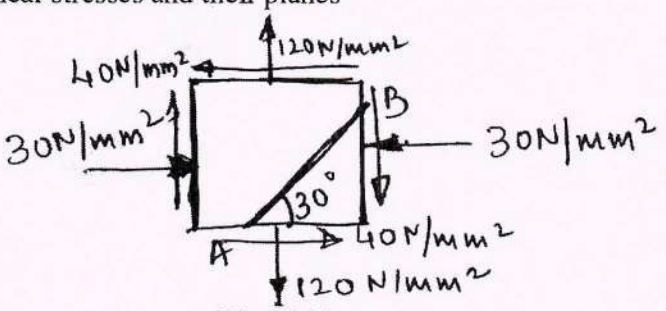

Fig.Q3(a) **(12 Marks)**

b. Derive an expressions for volumetric strain in case of a thin cylindrical shell of diameter 'd' subjected to internal pressure 'p'. **(05 Marks)**

c. Define: (i) Principal stresses (ii) Principal planes **(03 Marks)**

OR

4 a. A cylindrical shell is 3m long 1m internal diameter and is subjected to an internal pressure of 1 N/mm^2. If thickness of the shell is 12mm, find the circumferential stress and longitudinal stress. Also find maximum shear stress and the changes in the dimensions of the shell. Take E = 200 kN/mm^2 and $\mu = 0.3$. **(10 Marks)**

b. A thick metallic cylindrical shell of 150 mm, internal diameter is required to withstand an internal pressure of 8 MPa. Find the necessary thickness of cylinder, if permissible stress of the section is 20 MPa. **(10 Marks)**

Module-3

5 a. Derive relation between shear force, bending moment and load. **(06 Marks)**

b. Calculate SF and BM at salient points and draw SFD and BMD for the beam shown in Fig.Q5(b).

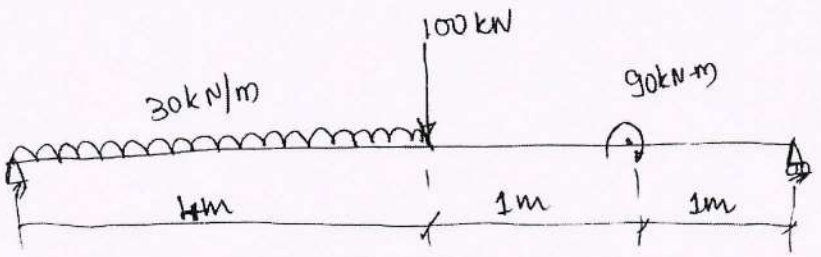

Fig.Q5(b) **(14 Marks)**

OR

6 a. Define: (i) Bending moment (ii) Shear force **(04 Marks)**

b. Draw SFD and BMD for beam shown in Fig.Q6(b).

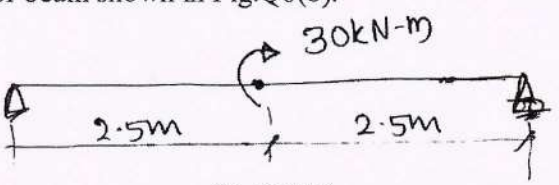

Fig.Q6(b) **(06 Marks)**

c. Draw SFD and BMD for simply supported beam of length L with point load 'P' placed at a distance 'a' from right support and 'b' from left support. **(10 Marks)**

Module-4

7 a. Define: (i) Torsional strength (ii) Torsional stiffness (iii) Torsional rigidity **(06 Marks)**

b. A shaft transmits 300 KW power at 120 rpm. Determine:

(i) The necessary diameter of solid circular shaft.

(ii) The necessary outer diameter of hollow circular section such that the inner diameter being 2/3 of the outer diameter. Take allowable shear stress as 70 N/mm^2. **(14 Marks)**

OR

8 Write short notes on any four:

a. Maximum principal stress theory

b. Maximum shear stress theory

c. Maximum principal strain theory

d. Maximum strain energy theory

e. Maximum shear strain energy theory **(20 Marks)**

Module-5

9 a. Show that for a rectangular cross section maximum shear stress is 1.5 times average shear stress. **(06 Marks)**

b. A simply supported beam of span 6 m has a cross section as shown in Fig.Q9(b). It carries 2 point loads each of 30 kN at a distance of 2m from each support. Calculate the bending stress and shear stress for maximum values of bending moment and shear force respectively. Draw neat diagram of bending stress and shear stress distribution across the cross section.

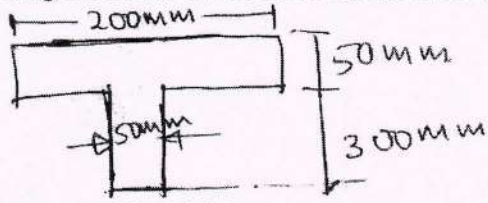

Fig.Q9(b) **(14 Marks)**

OR

10 a. Derive an expression for Euler's buckling load for long column with one end fixed and other end free. **(08 Marks)**

b. The cross section of a column is a hollow rectangular section with its external dimensions 200 mm × 150 mm. The internal dimension are 150 × 100 mm. The column is 5m long and fixed at both ends. If E = 120 GPa, calculate the critical load using Euler's formula. Compare the above load with the value obtained from Rankine's formula. The permissible compressive stress is 500 N/mm^2. The Rankine's constant is 1/6000. **(12 Marks)**

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CBCS SCHEME

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17CV33

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Fluid Mechanics

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define the following fluid properties. Also mention their units.
i) Specific Gravity ii) Viscosity iii) Mass Density iv) Specific Volume. **(06 Marks)**

b. Define capillarity and derive expressions for capillary rise and capillary fall. **(06 Marks)**

c. A differential manometer is connected at the two points A and B of two pipes as shown in Fig.Q.1(c). The pipe A contains a liquid of specific gravity of 1.5, while pipe B contains a liquid of specific gravity of 0.9. The pressures at A and B are 1kgf/cm^2 and 1.8kgf/cm^2 respectively. Find the difference is mercury level in the differential manometer. **(08 Marks)**

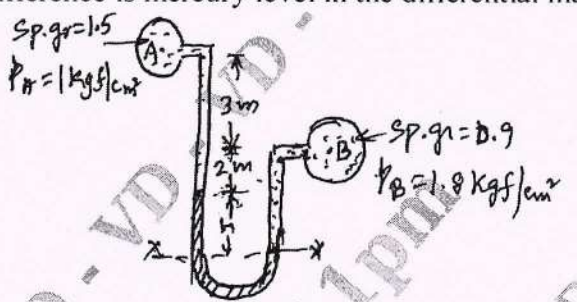

Fig.Q.1(c)

OR

2 a. With neat sketch, explain Bourdon tube pressure gauge. **(06 Marks)**

b. State and prove hydrostatic law of pressure. **(06 Marks)**

c. The dynamic viscosity of an oil used for lubrication between a shaft and sleeve is 0.6N.sec/m^2. The shaft is of diameter 0.4m and rotates at 190rpm. Calculate the power lost in the bearing for a sleeve length of 90mm. The thickness of the oil film is 1.5mm. **(08 Marks)**

Module-2

3 a. Define total pressure and centre of pressure. Also derive expressions for total pressure and centre of pressure for a plane surface submerged vertically in a liquid. **(08 Marks)**

b. Distinguish between:
i) Laminar Flow and turbulent flow
ii) Uniform flow and non uniform flow
iii) Steady flow and unsteady flow. **(06 Marks)**

c. Determine the total pressure and centre of pressure on an isosceles triangular plate of base 4m and altitude 4m when it is immersed vertically in an oil of specific gravity 0.9. The base of the plate coincides with the free surface of oil. **(06 Marks)**

OR

4 a. Derive the three dimensional continuity equation in the Cartesian coordinates. **(06 Marks)**

b. The velocity vector n a fluid flow is given as $V = 4x^3i - 10x^2yj + 2tk$. Find the velocity and acceleration of a fluid particle at (2, 1, 3) at time t =1. **(08 Marks)**

c. Determine the total pressure on a circular plate of diameter 1.5m which is placed vertically in water in such a way that the centre of the plate is 3m below the free surface of water. Find the position of centre of pressure also. **(06 Marks)**

Module-3

5 a. Define free vortex flow and forced vortex flow. Also mention two examples for each. **(04 Marks)**

b. Derive Euler's equation of motion along a stream line and obtain Bernoulli's equation from Euler's equation. Also mention the assumptions made in derivation. **(10 Marks)**

c. A 30cm × 15cm venturimeter is inserted on a vertical pipe carrying water, flowing in upward direction. A differential mercury manometer connected to the inlet and throat gives a reading of 20cm. Find the discharge. Take $C_d = 0.98$. **(06 Marks)**

OR

6 a. Derive an expression for discharge through a venturimeter. **(06 Marks)**

b. List the various instruments that works on the Bernoullie's principle. Also explain how pilot tube is used to measure velocity of flow. **(06 Marks)**

c. A 300mm diameter pipe carries water under a head of 20m with a velocity of 3.5m/s. If the axis of the pipe turns through 45°, find the magnitude and direction of the resultant force on the bend. **(08 Marks)**

Module-4

7 a. Give a detailed note on classification of orifices mouth pieces. **(06 Marks)**

b. Derive an expression for discharge through a Borda's mouth piece running free. **(06 Marks)**

c. Water flows over a rectangular weir 1m wide at a depth of 150mm and afterwards passes through a triangular right angled weir. Taking C_d for the rectangular weir and triangular weir as 0.62 and 0.59 respectively. Find the depth over triangular weir. **(08 Marks)**

OR

8 a. Give a detailed note on classification of weirs. Derive an expression for discharge through a triangular notch. **(10 Marks)**

b. Define hydraulic coefficients. Also mention the general values of hydraulic coefficients. **(06 Marks)**

c. A jet of water, issuing from a sharp edged vertical orifice under a constant head of 10cm at a certain point, has the horizontal and vertical coordinates measured from the vena-contracta as 20cm and 10.5cm respectively. Find the value of C_v and also value of C_c if $C_d = 0.6$. **(04 Marks)**

Module-5

9 a. Give a brief note on loss of energy in pipes. Also derive Darcy's Weisbach equation for loss of energy due to friction. **(10 Marks)**

b. Give a brief note on water harmer in pipes. **(04 Marks)**

c. Three pipes of lengths 800m, 500m and 400m and diameters 500mm, 400mm and 300mm respectively are connected in series. These pipes are to be replaced by a single pipe of length 1700m. Find the diameter of the single pipe. **(06 Marks)**

OR

10 a. Derive an expression for the loss of head due to sudden enlargement of pipe section. **(08 Marks)**

b. The water is flowing with a velocity of 1.5m/s in a pipe of length 2500m and of diameter 500mm. At the end of the pipe, a valve is provided. Find the rise in pressure if the valve is closed in 25 seconds. Take the value of C = 1460m/s. **(06 Marks)**

c. An oil of specific gravity 0.7 is flowing through a pipe of diameter 300mm at the rate of 500*l*/s. Find the head lost due to friction and power required to maintain the flow for a length of 1000m. Take $\gamma = 0.29$ stokes. **(06 Marks)**

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CBCS SCHEME

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17CV34

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Basic Surveying

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain classification of Surveying in detail. **(10 Marks)**

b. Explain principles of Surveying in detail. **(06 Marks)**

c. Distinguish between Plane and Geodetic survey. **(04 Marks)**

OR

2 a. Discuss accessories required for horizontal measurements in detail. **(10 Marks)**

b. To measure a base line, a steel tape 30m long standardized at 15°C with a pull of 100N was used. Find the correction per tape length if the temperature at the time of measurement was 20°C and the pull exerted was 160 N. If the length of 250m is measured on a slope of 1 in 4, find the horizontal length. Take $E = 2.1\times10^5$ N/mm^2 ; $\alpha = 11.2\times10^{-6}$/°C and cross-sectional area of tape = 0.08 cm^2. **(10 Marks)**

Module-2

3 a. Define Local attraction? How it defected? Explain. **(06 Marks)**

b. Distinguish between Prismatic compass and Surveyor's compass. **(04 Marks)**

c. Determine the bearings of sides of regular pentagon of sides 5m, if the bearing of the first line AB is 80°. **(10 Marks)**

OR

4 a. Explain the temporary adjustment of transit theodolite in detail. **(10 Marks)**

b. Discus the methods of Repetition and reiteration for measuring horizontal angle in detail with neat sketch. **(10 Marks)**

Module-3

5 a. What is meant by balancing of Traverse? Explain the Bowditch method of adjusting the traverse. **(10 Marks)**

b. In a closed traverse ABCDE, the length and bearings of EA has been omitted. Compute the length and bearing of the line EA.

Line	Length (m)	Bearing
AB	204	87° 30′
BC	226	20° 20′
CD	187	280° 0′
DE	192	210° 3′
EA	?	?

(10 Marks)

OR

6 a. Derive the distance and elevation formulae for stadia tachometry, when the staff is held vertical and the line of sight being inclined upwards and downwards with neat sketch. **(10 Marks)**

b. A tacheometer, fitted with an anallactic lens and having the multiplying constant 100, was setup at station C to determine the gradient between two points A and B and the following observations were taken, keeping the staff vertical.

Staff at	Vertical angle	Stadia readings
A	+4° 20′ 0″	1.300, 1.610, 1.920
B	+0° 10′ 40″	1.100, 1.410, 1.720

(10 Marks)

Module-4

7 a. The following readings were observed successively with a levelling instrument. The instrument was shifted after 5th and 11th readings.
0.585, 1.010, 1.735, 3.295, 3.775, 0.350, 1.300, 1.795, 2.575, 3.375, 3.895, 1.735, 0.635 and 1.605m.
Draw up a page of level book and determine the RL of various points if RL of first point is 136.440m. Use Rise and Fall method. **(10 Marks)**

b. Enumerate the errors in leveling in detail. **(10 Marks)**

OR

8 a. Derive an equation to determine the difference in elevation of the instrument station and top of a Chimney using Double plane method. **(10 Marks)**

b. The following observations were made on a hill top to ascertain its elevation. The height of the target F was 5m. The instrument stations were 100m apart and were in line with F.

Instrument Station	Staff reading on BM	Vertical angle	Remarks
01	2.550	18° 6′	RL of BM
02	1.670	28° 42′	= 345.580 m

(10 Marks)

Module-5

9 a. A railway embankment of formation width 10m is to be built with side slope of 1 vertical to 2 horizontal. The ground is horizontal in the direction transverse to the centre line. Length of embankment is 150m. The centre height of embankment at 25m intervals are as given below:
1.8, 3.3, 3.6, 4.2, 2.9, 2.6, 2.2m
Calculate the volume of earth filling. **(10 Marks)**

b. Explain the method of computation of volume by the
(i) Trapezoidal rule (ii) Prismoidal rule **(10 Marks)**

OR

10 a. Explain characteristics of contours with neat sketches. **(10 Marks)**

b. Discuss the uses of contour maps for various Civil engineering works with sketches. **(10 Marks)**

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CBCS SCHEME

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Fourth Semester B.E. Degree Examination, Jan./Feb.2021
Analysis of Determinate Structures

Time: 3 hrs. Max. Marks: 100

Note: 1. ***Answer any FIVE full questions, choosing ONE full question from each module.***
2. ***Assume any missing data, if any.***

Module-1

1 a. Explain different forms of structures with examples. **(04 Marks)**

b. Distinguish between determinate and indeterminate structures with examples. **(04 Marks)**

c. Find the forces in all the members of the truss shown in Fig. Q1 (c) and tabulate it. **(12 Marks)**

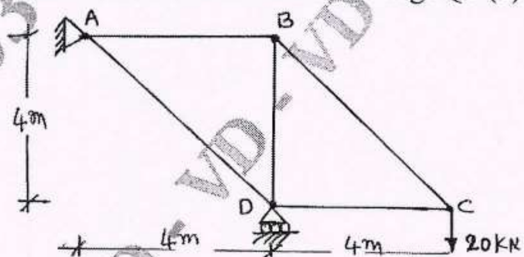

Fig. Q1 (c)

OR

2 a. List the assumptions made in the analysis of pin jointed plane truss. **(04 Marks)**

b. Determine the static and kinematic indeterminancy for the structures shown in Fig. Q2 (b). **(06 Marks)**

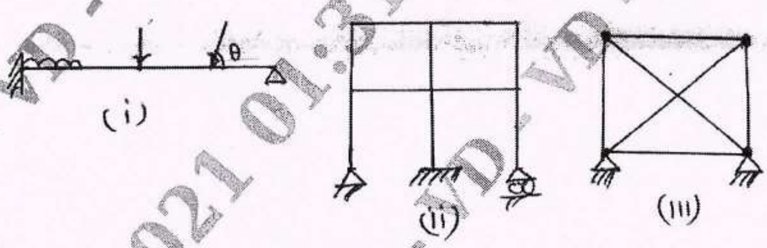

Fig. Q2 (b)

c. Find the forces in the members DE, DF and EF of the truss shown in Fig. Q2 (c) by method of sections. **(10 Marks)**

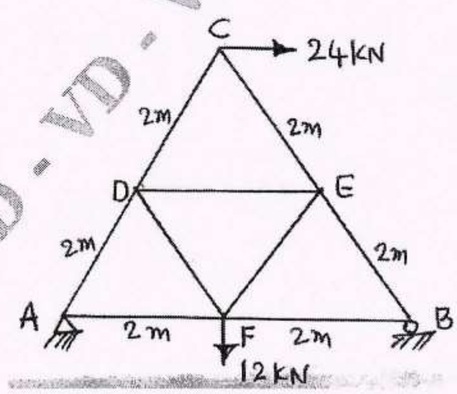

Fig. Q2 (c)

Module-2

3 a. Derive the differential equation of deflection curve for the beam. **(06 Marks)**

b. State conjugate beam theorems. **(04 Marks)**

c. Find deflection at 'C' and slope at A and B for the beam shown in Fig. Q3 (c) using moment area method. **(10 Marks)**

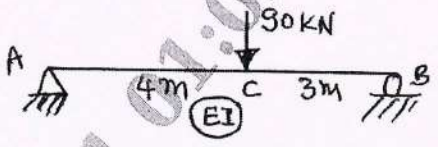

Fig. Q3 (c)

OR

4 a. State and prove moment area theorems. **(06 Marks)**

b. Find deflection at end of the Cantilever beam of span 'L' carrying udl of w/m runover entire span. Take EI constant using conjugate beam method. **(04 Marks)**

c. Find deflection at the load points C and D for the simply supported beam shown in Fig. Q4 (c) using Maculay's method. Take EI = 12000 kN-m^2 **(10 Marks)**

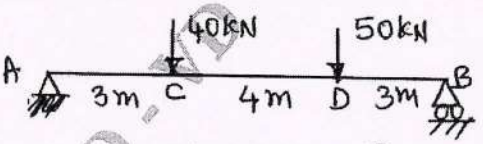

Fig. Q4 (c)

Module-3

5 a. State and prove in Castigliano's theorem – 1. **(06 Marks)**

b. State the principle of virtual forces. **(04 Marks)**

c. Determine the deflection at 'C' of the beam shown in Fig. Q5 (c) using strain energy method. **(10 Marks)**

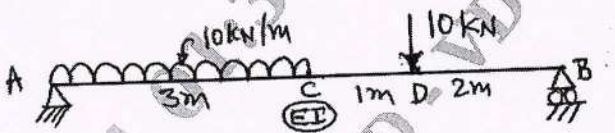

Fig. Q5 (c)

OR

6 a. Derive the expression for the strain energy stored in a beam due to flexure. **(06 Marks)**

b. Distinguish between strain energy and complimentary energy. **(04 Marks)**

c. Determine the horizontal deflection at 'C' of the truss loaded as shown in Fig. Q6 (c) using unit load method. All the members have same cross sectional area of 1500 mm^2 and E = 200 GPa. **(10 Marks)**

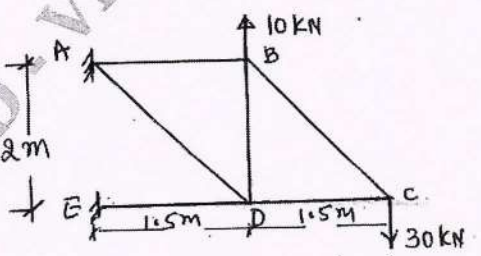

Fig. Q6 (c)

Module-4

7 a. A three hinged parabolic area has a span of 24 m and a central rise of 4 m. It carries concentrated loads of 75 kN at 18 m from the left support and udl of 45 kN/m over the left half of the portion. Determine the moment, normal thrust and radial shear at a distance 6 m from the left support. **(12 Marks)**

b. A cable used to support two loads of 40 kN and 40 kN across a span of 60 m. The cable length is 62 m. The loads acting at 20 m from left and right support. Find the tension in various segments of the cable shown in Fig. Q7 (b). **(08 Marks)**

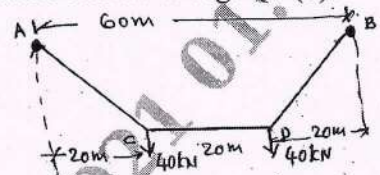

Fig. Q7 (b)

OR

8 a. A cable is suspended from two points A and B which are 80 m apart. A is 5 m below B. The lowest point on the cable is 10 m below A. The cable supports a udl of 20 kN/m over entire span. Calculate (i) reactions at supports (ii) Maximum tension in cable. **(08 Marks)**

b. A three hinged parabolic arch of span 50 m has its supports at depth 4m and 16 m below crown shown in Fig. Q8 (b). Determine reactions at the supports and bending moments under the loads. Also draw BMD. **(12 Marks)**

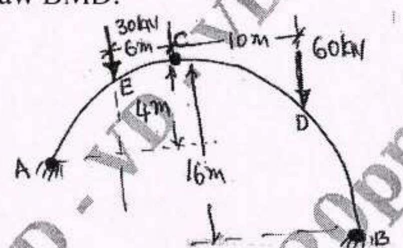

Fig. Q8 (b)

Module-5

9 a. Draw ILD for SF and BM at a section 3 m from left support for a S.S beam of span 12 m. Calculate maximum SF and BM at this section due to rolling load 5 m long and 2 kN/m intensity. **(08 Marks)**

b. A series of wheel loads crosses over a girder of span 15 m from left to right with 40 kN load leading as shown in Fig. Q9 (b). Determine maximum BM and SF at a section 4 m from left support. **(12 Marks)**

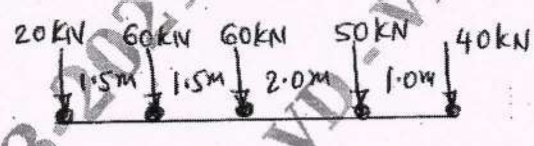

Fig. Q9 (b)

OR

10 a. Draw influence line diagram for shear force at any section from first principles. **(04 Marks)**

b. What is influence line and state the importance of influence lines? **(04 Marks)**

c. A train of five wheel loads crosses a simply supported beam of span 30 m as shown in Fig. Q10 (c). Calculate maximum positive and negative SF at midspan and absolute maximum BM anywhere in the span. **(12 Marks)**

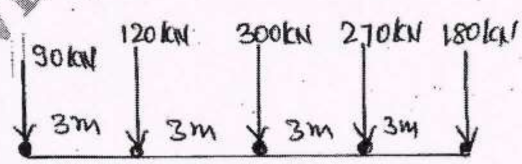

Fig. Q10 (c)

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CBCS SCHEME

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17CV43

Fourth Semester B.E. Degree Examination, Jan./Feb. 2021
Applied Hydraulics

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define dimensional homogeneity. Give two examples. **(04 Marks)**

b. Explain how repeating variables are selected for dimensional analysis in π-theorem. Also state π-theorem. **(06 Marks)**

c. The frictional torque T of a disc of diameter D rotating at a speed N in a fluid of viscosity μ and density ρ in a turbulent flow is given by

$$T = D^5 N^2 \rho \phi \left(\frac{\mu}{D^2 N \rho} \right).$$

Prove this by Buckingham's π - theorem. **(10 Marks)**

OR

2 a. Define (i) Metacentric height (ii) Buoyancy (iii) Prototype (iv) Similitude. **(08 Marks)**

b. What do you understand by Froude model law? Mention its applications. Derive any 5 scale ratios for physical quantities based on Froude model law. **(12 Marks)**

Module-2

3 a. Derive Chezy's equation for flow through an open channel. Bring out relation between N and C. **(10 Marks)**

b. A trapezoidal channel has to carry 142 m^3/minute of water is designed to have a minimum cross section. Find the bottom width and depth of the bed slope is 1 in 1200, the side slopes at 45° and Chezy's coefficient is 55. **(10 Marks)**

OR

4 a. What is specific energy? Define and draw specific energy curve and also derive expressions for critical depth and critical velocity. **(10 Marks)**

b. The discharge of water through a rectangular channel of width 6m is 18 m^3/sec when depth of flow of water is 2m. Calculate

(i) Specific energy of the flowing water
(ii) Critical depth and critical velocity
(iii) Value of minimum specific energy
(iv) State whether the flow is subcritical or supercritical. **(10 Marks)**

Module-3

5 a. Explain the term hydraulic jump with a neat sketch. Derive an expression for loss of energy due to hydraulic jump. **(10 Marks)**

b. A sluice gate discharges water into a horizontal rectangular channel with a velocity of 6 m/s and depth of flow is 0.4m. The width of the channel is 8m. Determine whether a hydraulic jump will occur and if so, find its height and loss of energy per kg of water. Also find power lost in the hydraulic jump. **(10 Marks)**

OR

6 a. With a neat sketch, explain what is back water curve and afflux. Derive an expression for length of backwater curve. **(10 Marks)**

b. Find the slope of the free water surface in a rectangular channel of width 15m having depth of flow 4m. Discharge through channel is 40 m^3/sec. Bed of channel is having a slope of 1 in 4000. Take Chezy's C = 50. **(10 Marks)**

Module-4

7 a. With a neat sketch explain the concept of velocity triangles. **(10 Marks)**

b. A jet of water having a velocity of 35 m/s impinges on a series of vanes moving with a velocity of 20 m/s. The jet makes an angle of 30° to direction of motion of vanes when entering and leaves at 12°.

(i) Draw velocity Δ^{les} at inlet and outlet

(ii) Find angles of vane tips so that water enters and leaves without shock.

(iii) Work done per unit wt. of water entering the vanes. **(10 Marks)**

OR

8 a. Draw a typical layout of a hydroelectric plant and explain various heads. **(10 Marks)**

b. A Pelton wheel is to be designed for following specifications:
Shaft power = 11,772 kW ; Head = 380 m ; Speed = 750 rpm ; Overall efficiency = 86% ; Jet diameter not to exceed $1/6^{th}$ of wheel ϕ. Determine (i) Wheel diameter (ii) No. of Jets. **(10 Marks)**

Module-5

9 a. Define Draft Tube. Explain the draft tube theory with a sketch. **(10 Marks)**

b. Draw Kaplan turbine and label the parts legibly. Give the working proportions. **(10 Marks)**

OR

10 a. With the help of a neat sketch, explain main parts of a centrifugal pump. **(07 Marks)**

b. The diameter of an impeller of a centrifugal pump at inlet and outlet are 30cm and 60 cm respectively. The velocity of flow at outlet is 2.0 m/s and the vanes are set back at an angle of 45° at the outlet. Determine the minimum starting speed of the pump of manometer η is 70%. **(08 Marks)**

c. Write a short note on multistage pumps. **(05 Marks)**

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CBCS SCHEME

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17CV45

Fourth Semester B.E. Degree Examination, Jan./Feb. 2021
Basic Geotechnical Engineering

Time: 3 hrs. Max. Marks: 100

Note: 1. ***Answer any FIVE full questions, choosing ONE full question from each module.***
2. ***Missing data if any, may be suitably assumed.***

Module-1

1 a. Sketch the phase diagram for a soil and indicate the volumes and weights of the phases on it. Define : Void ratio , Degree of saturation and Water content. **(10 Marks)**

b. What is the purpose of soil classification? Describe any three methods of field identification of soils. **(10 Marks)**

OR

2 a. Describe the laboratory method of determining the plastic limit and shrinkage limit of a soil. **(10 Marks)**

b. A soil sample with specific gravity of solids 2.70 has a mass specific gravity of 1.84. Assuming the soil to the perfectly dry, determine the void ratio. **(05 Marks)**

c. Describe the processes of soil formation. **(05 Marks)**

Module-2

3 a. Define 'Structure of a soil'. With neat sketches, describe the different types of structures of soil. **(10 Marks)**

b. With a neat sketch, explain the electrical diffuse double layer theory. **(10 Marks)**

OR

4 a. Discuss on the factors that influence the compaction of soils. Indicate their influence with illustrative sketches of compaction curves. **(10 Marks)**

b. Write a note on 'Proctor's Needle' and its use in field compaction control. **(04 Marks)**

c. Discuss the different compacting equipments used for compacting the soil in field. **(06 Marks)**

Module-3

5 a. List and explain the various factors that affect the permeability of a soil. **(10 Marks)**

b. The discharge of water collected from a constant head permeameter in 15 minutes is 500mℓ. The internal diameter of permeameter is 5cm and the measured difference in head between two gauging points 15cm vertically apart is 40cm. Calculate the co-efficient of permeability. If the dry weight of the 15cm long sample is 4.86N and the specific gravity of the solid is 2.65. Calculate the seepage velocity. **(10 Marks)**

OR

6 a. Define Darcy's Law. Derive the Laplace equation for seepage flow. **(10 Marks)**

b. A deposit of cohesionless soil with a permeability of 10^{-4} m/s has a depth of 6m with an impervious rock below. A sheet pile wall is driven into this deposit to a depth of 3m. The wall extends above the surface of the soil by 3m and 3m depth of water acts on one side and water level on the other side is 6.5m above the impervious rock. Sketch the flow net and determine the seepage quantity per meter length of the wall. **(05 Marks)**

c. What is a Flow net? What are its characteristics and uses? **(05 Marks)**

Module-4

7 a. Explain the method of determination of coefficient of consolidation by Logarithmic time method. **(07 Marks)**

b. With a neat sketch, explain Casagrande method of determination of preconsolidation pressure. **(07 Marks)**

c. In a consolidation teat, the void ratio of soil sample decreases from 1.20 to 1.10, when the pressure increases from 160 kN/m^2 to 320 kN/m^2. Determine the coefficient of consolidation, if $K = 8 \times 10^{-7}$ mm/s. **(06 Marks)**

OR

8 a. Explain the Mass – Spring Analogy theory of consolidation as applied to saturated clay soils. **(07 Marks)**

b. Explain normally consolidated, under consolidation and over consolidated soils. **(06 Marks)**

c. There is a bed of compressible clay of 4m thickness with pervious sand on top and impervious rock at the bottom. In a consolidation test on an undisturbed specimen of clay from this deposit, 90% settlement was reached in 4 hrs. The specimen was 20mm thick. Estimate the time in years for the building founded over this deposit to reach 90% of its final settlement. **(07 Marks)**

Module-5

9 a. Enumerate the various laboratory and field tests employed for determining shear strength of soil. Explain the triaxial compression test. **(10 Marks)**

b. What do you mean by sensitivity and thixotrophy in soils? **(04 Marks)**

c. The stresses at failure on failure plane in a cohesionless soil mass are : Shear stress = $4kN/m^2$ and Normal stress = $10kN/m^2$. Determine the resultant stress on the failure plane, the angle of internal friction of soil and the angle of inclination of failure plane to the major principle plane. **(06 Marks)**

OR

10 a. Explain the types of shear tests based on drainage conditions. **(06 Marks)**

b. With a neat sketch, explain total and effective stress paths. **(06 Marks)**

c. The results of shear box test are as follows :

Trail no	1	2	3	4
Normal stress, kN/m^2	50	100	200	300
Shear stress kN/m^2	36	80	154	235

Determine the shear parameters. Will the failure occur on the plane within the soil mass, when shear stress is 154 kN/m^2 and normal stress is $200kN/m^2$? **(08 Marks)**

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CBCS SCHEME

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17CV46

Fourth Semester B.E. Degree Examination, Jan./Feb. 2021
Advanced Surveying

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. List the different methods of setting out simple circular curves. Explain the angular method of setting out simple circular curve by Rankines method of deflection angles. **(10 Marks)**

b. Two tangents intersect at a chainage 1000mt, the deflection angle being 28°. Calculate the necessary data to setout a simple circular curve of 200mt radius by Rankine's method of deflection angles. Take per interval as 10mt. **(10 Marks)**

OR

2 a. What is a transition curve? List the functions and essential requirements of an ideal transition curve. **(06 Marks)**

b. Two straight with a total deflection angle of 72° are to be connected by a compound curve of two branches of equal length. The Radius of the first branch is 300mt and that of the second branch is 400mt, chainage at intersection point is 1500mt. Calculate the chainages of tangent points and that of Point of Compound Curvature (PCC). **(08 Marks)**

c. Two parallel railway lines are to be connected by a reverse curve of different radii. If the lines are 10mt apart and maximum distance between tangent points measured parallel to the straight is 45mt, calculate the Radius of the second branch if that at first branch is 65mt, calculate the length at both the branches. **(06 Marks)**

Module-2

3 a. List the various factors, that are to be considered in the selection at site for base line and stations in triangulation survey. **(06 Marks)**

b. Write a note on classification of triangulation system. **(06 Marks)**

c. From an eccentric station S, 12.25mt to the west of the main station B, the following angles were measured

$\angle BSC = 76°25'32''$ $\angle CSA = 54°32'20''$

The stations S and C are to the opposite sides at the line AB, calculate the correct angle ABC, if the lengths AB and BC are 5286.5 and 4932.2m respectively. **(08 Marks)**

OR

4 a. State and explain laws of weights. **(08 Marks)**

b. The following are the mean valves observed in the measurement of three angles α, β and γ at one station.

$\alpha = 76°42'46''.2$ with weight 4

$\alpha + \beta = 134°36'32''.6$ with weight 3

$\beta + \gamma = 185°35'24''.8$ with weight 2

$\alpha + \beta + \gamma = 262°18'10''.4$ with weight 1

Calculate the most probable value of each angle. **(12 Marks)**

Module-3

5 a. Define the following terms:
   i) The Celestial sphere
   ii) The azimuth
   iii) The sensible horizon
   iv) The hour angle. **(08 Marks)**

   b. Find the G.M.T corresponding to the following LMT:
   i) 9h 10m 12s A.M at a place in longitude 42°36′W
   ii) 4h 32m 10s A.M, at a place in longitude 56°32′E **(12 Marks)**

OR

6 a. Define the following terms:
   i) Zenith and Wadir
   ii) The visible horizon
   iii) The prime vertical
   iv) The hour angle **(08 Marks)**

   b. The standard time meredian in India is 82°30′E. If the standard time at any instant is 20 hours 24 minutes 6 seconds, find the local mean time for two places having longitudes i) 20°E ii) 20°W. **(12 Marks)**

Module-4

7 a. Define the following terms:
   i) Vertical photograph
   ii) Flying height
   iii) Perspective projecting
   iv) Exposure station **(08 Marks)**

   b. A vertical photograph was taken at an altitude of 1200 meters above mean sea level. Determine the scale of the photograph for terrain lying at elevations of 80meters and 300meter if the focal length of the camera is 15cm. **(12 Marks)**

OR

8 a. List the reasons for keeping overlap in photographs. **(08 Marks)**

   b. Describe how mosaic differs from a map. **(06 Marks)**

   c. A section line AB appears to be 10.16cm on a photograph for which the focal length is 16cm. The corresponding line measures 2.54cm on a map which is to a scale 1/50,000. The terrain has an average elevation of 200m above mean sea level. Calculate the flying altitude at the aircraft, above mean sea level, when the photograph was taken. **(06 Marks)**

Module-5

9 a. Define Remote sensing. List the applications in Civil Engineering. **(10 Marks)**

   b. What is GIS? With a neat sketch, explain the components of GIS. **(10 Marks)**

OR

10 a. What is GPS? Explain the basic principles of GPS and its application in surveying. **(10 Marks)**

   b. Explain the working principle of total stations and list the salient features of total station. **(10 Marks)**

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CBCS SCHEME

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15CV42

Fourth Semester B.E. Degree Examination, Jan./Feb. 2021
Analysis of Determinate Structures

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Determine static and Kinematic in determinacies of the structures shown in Fig Q1(a) i), ii), iii).

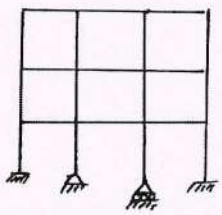

Fig Q1(a) – i)

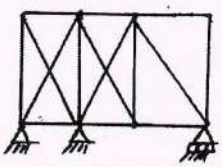

Fig Q1(a) – ii)

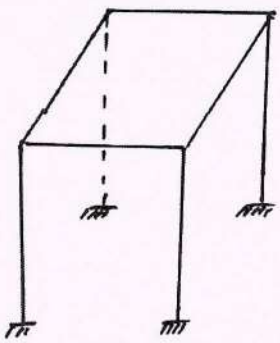

Fig Q1(a) – iii) **(08 Marks)**

b. Determine the forces in the numbered members of the loaded truss shown in Fig Q1(b) using method of sections.

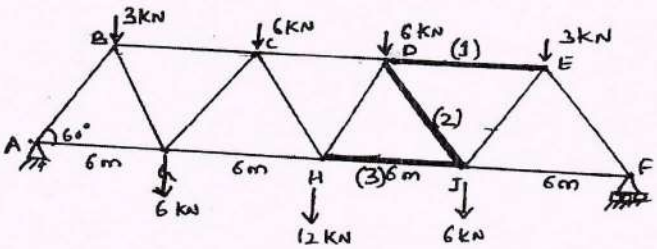

Fig Q1(b) **(08 Marks)**

OR

2 Determine forces in all the members of the truss shown in Fig Q2 using method of joints.

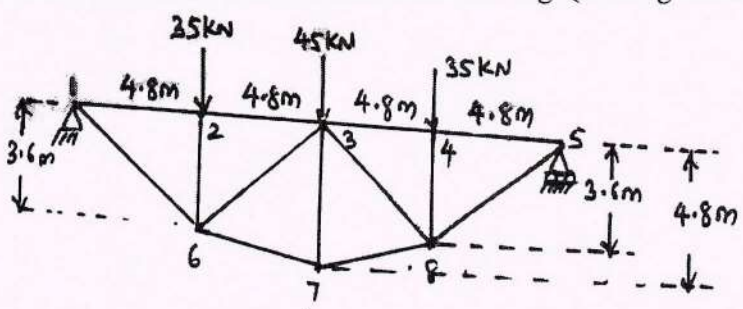

Fig Q2 **(16 Marks)**

Module-2

3 a. Determine maximum slope and maximum deflection for a simply supported beam subjected to a uniformly distributed load (throughout its span) using Double Integration method. **(06 Marks)**

b. Determine maximum slope and maximum deflection for the beam shown in Fig Q3(b) using Macaulay's method.

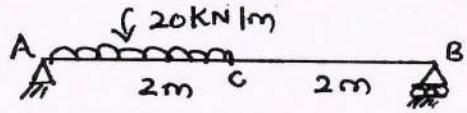

Fig Q3(b) **(10 Marks)**

OR

4 a. Obtain expression for maximum slope and maximum deflection for a Cantilever with a uniformly distributed load throughout its span, using moment-area method. **(06 Marks)**

b. Using Conjugate beam method determine maximum slope and maximum deflection for the simply supported beam shown in Fig Q4(b). $E = 204 \times 10^6$ kN/m^2 and $I = 50 \times 10^{-6}$m^4.

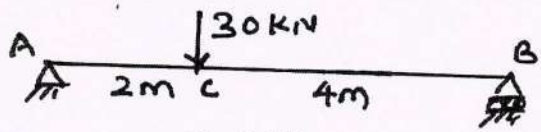

Fig Q4(b) **(10 Marks)**

Module-3

5 a. Determine vertical and horizontal deflections of the bent shown in Fig Q5(a), using Castigliano's method.

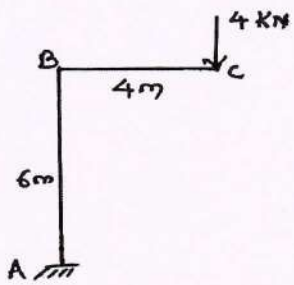

Fig Q5(a) **(12 Marks)**

b. Determine the expression strain energy stored in a member due to flexure, with usual notations. **(04 Marks)**

OR

6 Determine the vertical deflection at the free end of the truss shown in Fig Q6, using unit load method. The cross sectioned areas of members AD and DE are 1500mm^2, while those of other members are 1000mm^2. Take E = 200 kN/mm^2.

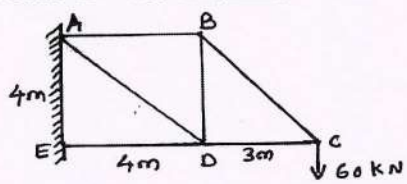

Fig Q6 **(16 Marks)**

Module-4

7 a. A three hinged parabolic arch of span 12m and central rise 3m is subjected to a uniformly distributed load of 30kN/m over its left half portion. Determine vertical reactions and horizontal thrust at the supports. Also determine Bending moment, Normal Thrust and Radial Shear at 3m from the left-hand support. **(12 Marks)**

b. A suspension cable 140m span and 14m central sag, carries a load of 1kN/m. calculate maximum and minimum tension in the cable. Find length of the cable. **(04 Marks)**

OR

8 A three hinged stiffening girder of a suspension bridge, of span 100m is subjected to two concentrated loads of 10kN each, placed at 20m and 40m respectively from the left end support. Determine bending moment and shear force at 30m from the left support. Also determine the maximum and minimum tensions in the supporting cable which has a central dip of 10m. **(16 Marks)**

Module-5

9 a. A simply supported beam has a span of 15m. A uniformly distributed load of 40 kN/m of length 5m passes over the beam from left to right. Using influence line diagram determine maximum bending movement at a section 6m from the left end. **(04 Marks)**

b. Four point loads 16, 30, 30 and 20kN have a centre to centre spacing of 2m between consecutive load and pass over a girder of 30m span from left to right with 20kN load leading. Calculate maximum bending moment and shear force at 8m from the left end, using influence line diagrams. **(12 Marks)**

OR

10 a. A train of concentrated loads shown in Fig Q10(a) move from left to right on a simply supported girder of span 16m. Determine absolute maximum bending moment developed in the beam.

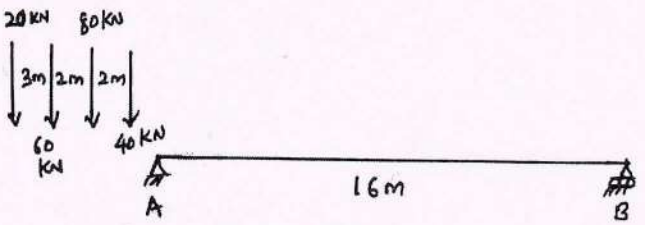

Fig Q10(a) **(08 Marks)**

b. Determine maximum forces in the members CE, DE and DF of the truss shown in Fig Q10(b), due to the dead load of 10 kN/m covering the entire span and a moving load of 20kN/m longer than the span passing over the truss. Consider the loads are transmitted through the lower chord.

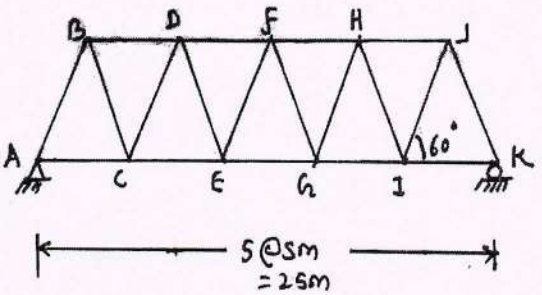

Fig Q10(b) **(08 Marks)**

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CBCS SCHEME

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15CV43

Fourth Semester B.E. Degree Examination, Jan./Feb.2021
Applied Hydraulics

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. State and explain Buckingham π-theorem. **(06 Marks)**

b. Derive the scale ratios of the following as per Reynolds model law:
(i) Time (ii) Discharge (iii) Force (iv) Acceleration
(v) Work (vi) Power **(06 Marks)**

c. A spillway model is constructed such that the velocity and discharge in the model are respectively 2 m/s and 3 m^3/s. If the velocity in the prototype is 20 m/s, what is the length scale ratio and the discharge in the prototype? **(04 Marks)**

OR

2 a. Explain the procedure of determining the metacenter in the laboratory. **(08 Marks)**

b. The efficiency η of a fan depends on density ρ, dynamic viscosity μ of the fluid, angular velocity ω, diameter D of the rotor and discharge Q. Express η as,

$$\eta = \phi\left[\frac{Q}{\omega D^3}, \frac{\mu}{\rho\omega D^2}\right]$$

where φ is the function. **(08 Marks)**

Module-2

3 a. Differentiate between:
(i) Hydraulic mean depth and hydraulic depth.
(ii) Steady flow and unsteady flow.
(iii) Critical flow, subcritical flow and supercritical flow. **(06 Marks)**

b. For most economical triangular section, show that crest angle is 90°. **(04 Marks)**

c. Water is flowing through a circular open channel at the rate of 500 lps, when the channel bed slope is 1 in 10000. Manning's n = 0.015. Find the diameter of channel if flow depth is 0.75 times the diameter. **(06 Marks)**

OR

4 a. Define specific energy. Draw specific energy curve and explain salient points. For rectangular channel prove that $E_{min} = 1.5y_c$ at critical flow condition. E_{min} = minimum specific energy, y_c = Critical depth . **(10 Marks)**

b. A concrete lined circular channel of 3.6 m diameter has a bed slope of 1 in 600. Determine velocity and discharge for maximum velocity condition. Chezy's C = 50. **(06 Marks)**

Module-3

5 a. Derive the relationship between sequent depths of hydraulic jump in rectangular jump in terms of approaching Froude number. **(08 Marks)**

b. A horizontal rectangular channel 4 m wide carries a discharge of 16 m^3/s. Determine whether a jump occurs at an initial depth of 0.5 m or not. If a jump occurs, determine the sequent depth and energy loss. **(08 Marks)**

OR

6 a. In a rectangular channel, the Froude number before jump $F_1 = 2.5$. Compute the Froude number after jump. **(04 Marks)**

b. Give the classification of GVF profiles with neat sketches. **(12 Marks)**

Module-4

7 a. Show that for a free jet of water sriking at the center of semicircular vane, the maximum efficiency occurs when vane velocity is $\frac{1}{3}$ of jet velocity and $\eta_{max} = 59.2\%$. **(08 Marks)**

b. A jet of water having velocity 45 m/s impinges without shock on a series of curved vanes moving at 15 m/s, the direction of motion of vanes being 20° to that of jet. The relative velocity at the outlet is 0.9 of that at inlet and the absolute velocity of water at the exit is to be normal to the motion of vanes. Find : (i) Vane angles at entrance and exit
(ii) Hydraulic efficiency. **(08 Marks)**

OR

8 a. Give the classification of turbines based on different criteria. **(08 Marks)**

b. A penstock supplies water form a reservoir to the Pelton wheel with a gross head of 500 m. One third of the gross head is lost in friction in the penstock. The rate of flow of water through the nozzle fitted at the end of the penstock is 2 m^3/s. The angle of deflection of jet is 165° when the vanes are stationary. Determine the power given by the water to the runner and also hydraulic efficiency. Take $C_V = 1.0$ and Speed ratio = 0.45. **(08 Marks)**

Module-5

9 a. Differentiate between :
(i) Francis turbine and Kaplan turbine.
(ii) Unit discharge and actual discharge.
(iii) Unit speed and specific speed. **(06 Marks)**

b. What is draft tube? What are its functions? **(04 Marks)**

c. A centrifugal pump running at 1450 rpm discharges 700 lps against a head of 23 m. If the diameter of the impeller is 250 mm and width is 50 mm, find the vane angle at the outer periphery. Take $\eta_{man} = 75\%$. **(06 Marks)**

OR

10 a. Define minimum starting speed of a centrifugal pump and derive the expression for the same. **(06 Marks)**

b. Define : (i) Suction head, (ii) Delivery head, (iii) Static head
(iv) Manometric head **(04 Marks)**

c. A Kaplan turbine produces 60000 kW power under net head of 25 m with an overall efficiency of 90%. Taking speed ratio = 1.6 and flow ratio = 0.5 with hub diameter = 0.35 times diameter, find the diameter and speed of the turbine. **(06 Marks)**

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CBCS SCHEME

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15CV45

Fourth Semester B.E. Degree Examination, Jan./Feb. 2021
Basic Geo-Technical Engineering

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. With the help of three phase diagram, explain :
i) Void ratio
ii) Porosity
iii) Water content
iv) Degree of saturation. **(08 Marks)**

b. Explain the laboratory procedure to determine the water content present in the soil using hot air oven. **(04 Marks)**

c. An oven dried soil weighing 1.854N is placed in a pyknometer. The total weight of the pyknometer along with soil and water is 15.51N. The pyknometer with water alone weighs 14.34N. Determine the specific gravity of the soil. **(04 Marks)**

OR

2 a. Define Liquid limit, plastic limit and shrinkage limit. **(06 Marks)**

b. Explain Indian standard soil classification system. **(06 Marks)**

c. Determine the dry density and void ratio. Given $V_b = 26kN/m^3$, W = 16%, G = 2.67. **(04 Marks)**

Module-2

3 a. Explain with sketches, the common clay minerals. **(08 Marks)**

b. A cohesive soil yields a maximum dry density of $18kN/m^3$ at on OMC of 16% during a standard proctor test. If G = 2.65. What is the degree of saturation? **(08 Marks)**

OR

4 a. Distinguish between standard proctor and modified proctor tests. **(04 Marks)**

b. Explain the laboratory procedure for conducting test on soil to determine its maximum dry density and optimum moisture content. **(06 Marks)**

c. What are the effects of compaction? **(06 Marks)**

Module-3

5 a. What is a flow net? What are the uses and characteristics of flow nets? **(08 Marks)**

b. Compute the quantity of water seeping under a weir per day for which the flow net has been constructed. The coefficient of permeability is 2×10^{-2}mm/s, $n_f = 5$ and $n_d = 18$. The difference in water level between O/S and D/S is 3.0m. The length of weir is 60m. **(08 Marks)**

OR

6 a. What are the factors affecting permeability? Explain them briefly. **(06 Marks)**

b. A soil sample 90mm high and 6000mm is in cross-section was subjected to a falling-head permeability test. The head fell from 500mm to 300mm in 1500s. The permeability of the soil was 2.4×10^{-3} mm/s. Determine the diameter of its stand pipe. **(10 Marks)**

Module-4

7 a. Explain Mass-Spring Analogy. **(08 Marks)**

b. Explain over consolidated soil, normally consolidated soil and under consolidated soil. **(08 Marks)**

OR

8 a. Explain square root of time fitting method. **(06 Marks)**

b. A 20m thick isotropic clay stratum over lies an imperrious rock. The coefficient of consolidation of soil is 5×10^{-8} mm^2/s. Find the time required for 50% and 90% consolidation. Time factors are 0.2 and 0.85 for u = 50% and u = 90% respectively. **(10 Marks)**

Module-5

9 a. Explain Mohr–Coulomb failure theory of soil. **(04 Marks)**

b. What are the factors affecting the shear strength of soil. **(04 Marks)**

c. A direct shear test was conducted on a soil and the following results were obtained.

Normal stress	kN/m^2	55	105	145
Shear stress	kN/m^2	30	36	41

Determine graphically, the cohesive strength and the angle of shearing resistance. **(08 Marks)**

OR

10 a. Explain the list procedure involved in conducting the direct shear list on soil. **(06 Marks)**

b. Define thixotrophy and sensitivity. **(04 Marks)**

c. When an unconfined compression test is conducted on a cylinder of soil, it fails under an axial stress of $120kN/m^2$. The failure plane makes an angle of 50° with the horizontal. Determine the cohesion and the angle of internal friction of soil. **(06 Marks)**

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CBCS SCHEME

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18CV32

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Strength of Materials

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain longitudinal strain and lateral strain. **(04 Marks)**

b. State and illustrate Saint Venant's principle. **(06 Marks)**

c. A tension test was conducted on mild steel bar and the following data was obtained from the test:
Diameter of the bar = 18mm
Gauge length of the bar = 82mm
Load at proportional limit = 75KN
Extension at a load of 62KN = 0.113mm
Load at failure = 82KN
Final gauge length of the bar = 106mm
Diameter of the bar at failure = 14mm
Determine the Young's modulus, proportional limit, true breaking stress, %elongation and percentage reduction in cross sectional area. **(10 Marks)**

OR

2 a. What are the elastic constants and explain them briefly. **(06 Marks)**

b. Obtain expression for temperature stress in a bar of uniform cross section when expansion or contraction is prevented partially. **(04 Marks)**

c. A weight of 390KN is supported by a short column of 250mm square in section. The column is reinforced with 8 steel bars of cross sectional area 2500mm^2. Find the stresses in steel and concrete if $E_s=15E_c$.
If stress in concrete must not exceed 4.5MN/m^2, what area of steel is required in order that column may support a load of 480KN. **(10 Marks)**

Module-2

3 a. Derive Lame's equation for the radial and hoop stress for thick cylinder subjected to internal and external fluid pressure. **(08 Marks)**

b. A 2-dimensional element has the tensile stresses of 600MN/m^2 and compressive stress of 400MN/m^2 acting on two mutually perpendicular planes and two equal shear stresses of 200MN/m^2 on their planes. Determine
i) Resultant stress on a plane inclined at 30° wrt x-axis.
ii) The magnitude and direction of principal stresses.
iii) Magnitude and direction of maximum shear stress. **(12 Marks)**

OR

4 a. Obtain expression for volumetric strain in thin cylinder subjected to internal pressure in the form of $e_v=\frac{pd}{2tE}\left[\frac{5}{2}-\frac{2}{m}\right]$. **(08 Marks)**

b. A cast iron pipe has 200mm internal diameter and 50mm metal thickness and carries water under a pressure of 5N/mm^2. Calculate the maximum and minimum intensities of circumferential stresses and sketch the distribution of circumferential stress intensity and the intensity of radial pressure across the section. **(12 Marks)**

Module-3

5 a. Define shear force, bending moment and point of contraflexure. Explain how to calculate them? **(06 Marks)**

b. Develop shear force diagram and bending moment diagrams for the beam loaded shown in Fig. Q5(b) marking the values at salient points. Determine the position and magnitude of maximum bending moment.

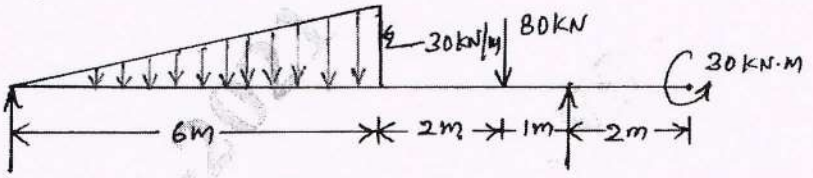

Fig. Q5(b) **(14 Marks)**

OR

6 a. Obtain the relationship between udl, shear force and bending moment. **(06 Marks)**

b. Construct SFD and BMD for the beam loaded shown in Fig. Q6(b). Also locate the point of contraflexure.

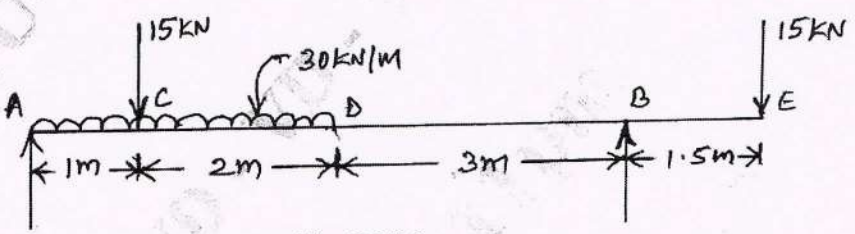

Fig.Q6(b) **(14 Marks)**

Module-4

7 a. Derive torsional equation with usual notations. **(06 Marks)**

b. A T-section of flange 120mm×12mm and overall depth 200mm with 12mm web thickness is loaded such that at a section it has a bending moment of 20KN.m and shear force of 120KN. Sketch the bending and shear stress distribution diagram marking the salient values. **(14 Marks)**

OR

8 a. Derive Bernoulli-Euler bending equation with usual notations. **(08 Marks)**

b. A solid circular shaft has to transmit power of 1000KW at 120rpm. Find the diameter of the shaft if the shear stress of the material is not to exceed 80N/mm^2. The maximum torque is 1.25 times the mean torque. What percentage saving in material could be obtained if the shaft is replaced by a hollow one whose internal diameter is 0.6 times the external diameter? The length of the shaft, material and maximum shear stress being same. **(12 Marks)**

Module-5

9 a. Define slope, deflection and elastic curve. Explain Macaulay's method of determining slope and deflection. **(10 Marks)**

b. Compare the crippling loads given by Euler's and Rankine's formula for a tubular steel column 2.5m long having outer and inner diameter as 40mm and 30mm respectively. The column is loaded through pin joints at the ends. Take permissible compressive stress as 320N/mm^2, Rankine constant as $\frac{1}{7500}$ and E=210GPa. For what length of the column of their cross section, does the Euler's formula cease to apply? **(10 Marks)**

OR

10 a. Differentiate between short and long column and what are the limitations of Euler's theory. **(06 Marks)**

b. Calculate slope at A and deflection at D for the overhanging beam shown in Fig. Q10(b). Take E = 200GPa and I = 50×10^6mm^4. **(14 Marks)**

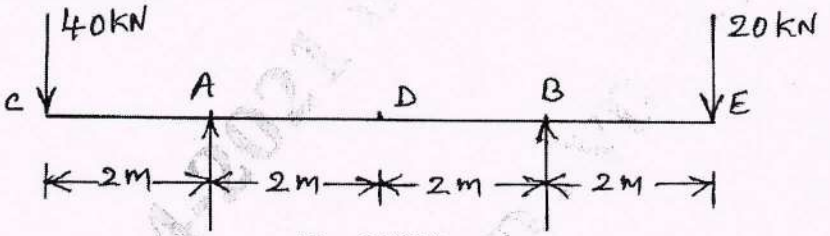

Fig. Q10(b).

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18CV33

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Fluid Mechanics

Time: 3 hrs. Max. Marks: 100

Note: **1.** ***Answer any FIVE full questions, choosing ONE full question from each module.***
2. ***Assume missing data (if any) suitably.***

Module-1

1 a. Define the following and mention their units:
(i) Capillarity (ii) Surface tension (iii) Viscosity **(06 Marks)**

b. Derive an expression for capillary rise/fall of fluid in a tube of small diameter with sketches. **(06 Marks)**

c. A 100 mm diameter cylinder rotates concentrically inside a 105 mm diameter fixed cylinder. The length of both the cylinders is 250 mm. find the viscosity of the liquid that fills the space between the cylinders, if a torque of 1.0 N-m is required to maintain a rotating speed of 120 rpm. **(08 Marks)**

OR

2 a. State and prove Pascal's law for the intensity of pressure at a point in a static fluid. **(06 Marks)**

b. Derive an expression for difference in pressure between two points using a U-tube differential manometer. **(08 Marks)**

c. Determine the pressure intensity at the bottom of a tank filed with an oil of specific gravity 0.7 to a height of 10 m. **(06 Marks)**

Module-2

3 a. Define: (i) Total pressure (ii) Center of pressure **(04 Marks)**

b. Derive an expression for total pressure and center of pressure for an inclined plane surface submerged in a liquid. **(08 Marks)**

c. A 1200 mm × 1800 mm size rectangular plate is immersed in water with an inclination of 30° to the horizontal. The 1200 mm side of the plate is kept horizontal at a depth of 30 m below the water surface. Compute the total pressure on the surface and the position of center of pressure. **(08 Marks)**

OR

4 a. Differentiate between:
(i) Uniform and non-uniform flow
(ii) Steady and unsteady flow **(04 Marks)**

b. Derive continuity equation for a three dimensional flow in Cartesian coordinates. **(08 Marks)**

c. Evaluate stream function ψ and compute velocity of flow, V, for a two-dimensional flow field given by, $u = 4x^3$ and $v = -12x^2y$ at point (1, 2). Assume $\psi = 0$ at point (0, 0). **(08 Marks)**

Module-3

5 a. State Impulse Momentum principle. Give fields where it is applied. **(04 Marks)**

b. Derive an expression for force exerted by a fluid on a pipe bend. **(08 Marks)**

c. A pipe of 300 mm diameter, carrying 15000 litres per minute of water is bent by 135°. Find the magnitude and direction of resultant force exerted by the flowing fluid on the bend if the pressure of the flowing water is 39.24 N/cm^2. **(08 Marks)**

OR

6 a. What is venture effect? Derive an expression for discharge through a venturimeter. **(08 Marks)**

b. A pitot tube fixed in a pipe of 300 mm diameter is used to measure the velocity and rate of flow. If the stagnation and static pressure heads are 6.0 m and 5.0 m respectively, compute the velocity and rate of flow. Assume $C_V = 0.98$ for the pitot tube. **(06 Marks)**

c. A 20 cm × 10 cm venturimeter is used to measure the flow of water in a horizontal pipe. The pressure at the inlet of venturimeter is 17.658 N/cm^2 and the vacuum pressure at the throat is 30 cm of mercury. Find the discharge of water through the venturimeter assuming $C_d = 0.98$. **(06 Marks)**

Module-4

7 a. Define hydraulic coefficients for an orifice and give the relation between them. **(06 Marks)**

b. Give classification of mouth pieces with suitable sketches. **(06 Marks)**

c. A jet of water issuing from an orifice 25 mm diameter under a constant head of 1.50 m, falls 0.915 m vertically before it strikes the ground at a horizontal distance of 2.288 m from vena-contracta. The discharge is found to be 102 litres per minute. Calculate the hydraulic coefficients of the orifice. **(08 Marks)**

OR

8 a. Enumerate advantages of triangular notches over rectangular notches. **(04 Marks)**

b. Derive the expression for discharge through a triangular notch. **(08 Marks)**

c. A river 60 m wide has vertical banks and 1.50 m depth of flow. The velocity of flow is 1.20 m/s. A broad crested weir 2.40 m high is constructed across the river. Find the head on the weir crest considering the velocity of approach. Assume $C_d = 0.90$. **(08 Marks)**

Module-5

9 a. Derive Darcy-Weisbach equation for head loss due to friction in a pipe. **(08 Marks)**

b. List major and minor losses in a pipe flow. **(04 Marks)**

c. Water is required to be supplied to a colony of 4000 residents at a rate of 180 lires per person from a source 3 km away. If half the daily requirement needs to be pumped in 8 hours against a friction head of 18 m, find the size of the main pipe supplying water. Assume friction factor as 0.028. **(08 Marks)**

OR

10 a. What is an equivalent pipe? Derive an expression for diameter of an equivalent pipe. **(08 Marks)**

b. Explain phenomenon of water hammer in pipes. **(04 Marks)**

c. Water is flowing in a pipe of 150 mm diameter with a velocity of 2.5 m/s, when it is suddenly brought to rest by closing the valve. Find the pressure rise in the pipe assuming it to be elastic with E = 206 GN/m^2 and Poisson's ration = 0.25. The bulk modulus of water, K = 206 GN/m^2. Thickness of pipe wall is 5 mm. **(08 Marks)**

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CBCS SCHEME

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18CV34

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Building Materials and Construction

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. What are the factors that cause deterioration of stones and explain the methods commonly adopted to preserve the stones. **(08 Marks)**

b. Briefly explain the various field and laboratory tests conducted on bricks to find its suitability for construction. **(08 Marks)**

c. What are the advantages of cement concrete blocks? **(04 Marks)**

OR

2 a. Lists the tests conducted on fine aggregates and explain any one of them in detail. **(08 Marks)**

b. Explain impact and abrasion tests conducted on coarse aggregates. **(08 Marks)**

c. What are the characteristics of good timber used for construction? **(04 Marks)**

Module-2

3 a. What are the functions of a foundation? Mention the situations during which pile foundations are adopted. **(08 Marks)**

b. Write a note on:
i) Spread footing ii) Strap footing **(08 Marks)**

c. Write the advantages of cavity walls. **(04 Marks)**

OR

4 a. Sketch the elevation of a brick wall built in i) English bond ii) Flemish bond. Compare the merits and demerits of English bond and Flemish bond. **(08 Marks)**

b. Write a note on classification of stone masonry. **(08 Marks)**

c. Write a note on partitions walls. **(04 Marks)**

Module-3

5 a. Draw a neat sketch of an arch and explain the technical terms used. **(08 Marks)**

b. Explain i) Chejja ii) Canopy iii) Balcony iv) Lintel. **(08 Marks)**

c. Write a note on stability of arch. **(04 Marks)**

OR

6 a. List the types of flooring and explain the method of laying of cement concrete flooring in detail. **(08 Marks)**

b. List the classification of pitched roof. With neat sketches explain any two of them. **(08 Marks)**

c. What are the factors to be considered while selecting a roof covering? **(04 Marks)**

Module-4

7 a. With the help of a neat sketch explain
i) Paneled door ii) Collapsible door. **(08 Marks)**

b. Write a note on
i) Bay window ii) Steel window **(08 Marks)**

c. What are the guidelines to be followed while locating doors and windows? **(04 Marks)**

OR

8 a. Write a note on
i) Shoring ii) Underpinning. **(08 Marks)**

b. Plan a dogged stair for a building in which vertical distance between the floors is 3.6m. The stair hall measures 2.8m×5.0m (internal dimension). **(08 Marks)**

c. With the help of a neat sketch explain
i) Tread and Riser ii) Flight and Landing. **(04 Marks)**

Module-5

9 a. What are the objectives of plastering? Explain the defects in plastering. **(10 Marks)**

b. Briefly explain the methods of damp proofing. **(10 Marks)**

OR

10 a. Explain the method of laying stucco plastering and lathe plastering. **(10 Marks)**

b. Explain the constituents of a paint and explain the procedure of painting on new wood works. **(10 Marks)**

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CBCS SCHEME

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18CV35

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Basic Surveying

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Define surveying. Discuss the classification of surveying. **(10 Marks)**

b. What is ranging? Explain the indirect method for ranging with neat sketch. **(08 Marks)**

c. What is well conditioned triangle? **(02 Marks)**

OR

2 a. Write short notes on optical square and prism square. **(06 Marks)**

b. A big pond obstructs the chain line such that P and T are on the opposite sides of a pond and line PQ and PR were selected on the left hand side and Right hand side respectively. So that point Q, T and R were in straight line. Find length PT. Take PQ 150m, PR = 230m, QT = 75m, RT = 100m. **(08 Marks)**

c. Explain briefly chains on slopping ground by stepping method. **(06 Marks)**

Module-2

3 a. Differentiate between :
i) True meridian and magnetic meridian ii) Dip and declination iii) Agonic and isogonic lines. **(06 Marks)**

b. The following bearings were observed with compass. Calculate the interior angles and draw rough diagram.

Line	AB	BC	CD	DE	EA
Bearing	60°30′	122°0′	46°0′	205°30′	300°

(08 Marks)

c. What is local attraction? How it is detected and eliminated? Also give the reason for it. **(06 Marks)**

OR

4 a. What is traversing? What are the different types of traversing? **(04 Marks)**

b. What is closing error? Explain the Bowditch rule of graphical adjustment with sketch. **(08 Marks)**

c. Following are the observed length and bearings of the lines of a closed traverse ABCDEA. The length and bearing of line EA emitted, calculate it.

Line	Length (m)	Bearings
AB	204	87°30′
BC	226	20°20′
CD	187	280°0′
DE	192	210°30′
EA	?	?

(08 Marks)

Module-3

5 a. Explain the following terms. i) Elevation ii) Benchmark iii) Datum iv) Mean sea level. **(04 Marks)**

b. What do you understand by balancing of sight? With figure explain how the errors are eliminated. **(06 Marks)**

c. The following is the page of a level book. Find out the missing reading(X) and complete the level book. Apply usual arithmetical check.

Sl.No.	BS	IS	FS	HI	RL	Remark
1	4.000			X	X	
2		X			195.935	
3	2.150		3.995	X	X	
4		2.415			195.240	BM
5		1.665			X	
6		X			200.770	
7	3.610		X	X	X	
8			1.715		196.985	

(10 Marks)

OR

6 a. Write short notes on : i) Curvature and Refraction error ii) Borometric leveling and fly leveling iii) Collimation error and hypsometry. **(06 Marks)**

b. Describe the procedure for reciprocal leveling with neat sketch. **(06 Marks)**

c. The following observations were taken in reciprocal leveling. Determine the R.L of B if that of A is 100.150m. Also calculate the collimation error if AB = 1000m.

Inst. Station	Staff reading	
	A	B
A	1.625	2.545
B	0.725	1.405

(08 Marks)

Module-4

7 a. Describe briefly radiation method and intersection method of plane tabling. **(10 Marks)**

b. Define two point problem. Explain the graphical method of solution of two point problem with figure. **(10 Marks)**

OR

8 a. Write short notes on :i) Orientation of plane table ii) Triangle of error iii) Alidade. **(06 Marks)**

b. Discuss the temporary adjustments of plane table. **(06 Marks)**

c. What are the advantages and disadvantages of plane table? **(08 Marks)**

Module-5

9 a. What is contour? What are the uses of contour lines? **(08 Marks)**

b. A road embankment is 11m wide at the formation level and has side slope 1 : 2(V : H). The ground level at every 80m along centre line are shown in table. The formation level at zero chainage is 123.0 and embankment having a rising gradient 1 : 100 calculate the volume of earthwork by trapezoidal and primordial rule.

Dist.	0	80	160	240	320
RL	120.8	122.5	123.4	123.8	124.5

(12 Marks)

OR

10 a. Define the following terms : i) Contour interval ii) Interpolation of contour iii) Horizontal equivalent v) Contour gradient. **(04 Marks)**

b. What is planimeter? Explain the polar planimeter along with essential parts. **(12 Marks)**

c. Determine the area of plan from following data. Needle point out side plan. Zero of dial passed index mark once in clockwise direction : Initial reading = 8.364
Final reading = 4.234. **(04 Marks)**

CBCS SCHEME

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18CV36

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Engineering Geology

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Discuss in brief different branches of Geology, which are related to Civil Engineering. **(04 Marks)**

b. Briefly explain the internal structure of the earth based on different unconformities and add a note on its composition. **(08 Marks)**

c. Explain the role of Geology in the field of Civil Engineering. **(08 Marks)**

OR

2 a. What is Mineral? Describe the following Physical properties of a Mineral.
i) FORM ii) Hardness iii) Fracture. **(06 Marks)**

b. Explain the primary structures in Sedimentary rocks, with neat sketches. **(08 Marks)**

c. Write a note on Soil profile. **(06 Marks)**

Module-2

3 a. What are Folds? How are they caused? Discuss the various types of folds in rock and influences on Civil Engineering. **(15 Marks)**

b. What is Normal Fault? Add a note on Horst and Graben, with neat sketches. **(05 Marks)**

OR

4 a. What is Weathering? Describe Physical and Mechanical weathering. **(10 Marks)**

b. Explain Railway ballast with examples. **(05 Marks)**

c. Write notes on causes of Landslides. **(05 Marks)**

Module-3

5 a. What is an Out Crop? Describe the terms strike and DIP, with a neat sketch. **(08 Marks)**

b. Explain Floods, causes and its control. **(06 Marks)**

c. Write a note on Tunneling through the fold axis of an Antidine. **(06 Marks)**

OR

6 a. Briefly explain Exogeneous and Endogeneous geological events. **(06 Marks)**

b. Describe the different drainage patterns of a River basin, with neat sketches. **(08 Marks)**

c. Briefly explain Extrusive and Intrusive forms of Igneous rocks. **(06 Marks)**

Module-4

7 a. Explain the Electrical resistivity method for exploration of ground water. **(08 Marks)**

b. Explain how the quality of ground water can be determined by SAR , RSC , GTH. **(04 Marks)**

c. Explain how Artificial recharge of ground water can be made. **(08 Marks)**

OR

8 a. Describe with a neat diagram, Vertical distribution of Ground water. **(10 Marks)**

b. Write a brief note on Land forms. **(10 Marks)**

Module-5

9 a. What is an Earth Quake? Describe the Tectonic causes of Earthquake and its effects. **(08 Marks)**

b. Explain Aquifer and its types. **(06 Marks)**

c. Write a note on Specific Yield and Specific Retention. **(06 Marks)**

OR

10 a. What is Remote Sensing? Write its application in Civil Engineering. **(08 Marks)**

b. What is GIS? Name the different components of GIS. **(06 Marks)**

c. Write an application on Global Positioning System (GPS) in Civil Engineering. **(06 Marks)**

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CBCS SCHEME

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17CV/CT32

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Strength of Materials

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define: (i) Young's modulus (ii) Bulk modulus (iii) Poisson's ratio. Derive a relationship between them. **(10 Marks)**

b. Two solid cylindrical rods are connected and loaded as shown in Fig.Q1(b). Determine: (i) Total deformation (ii) Deformation at point B. $E_S = 200$ GPa, $E_b = 100$ GPa.

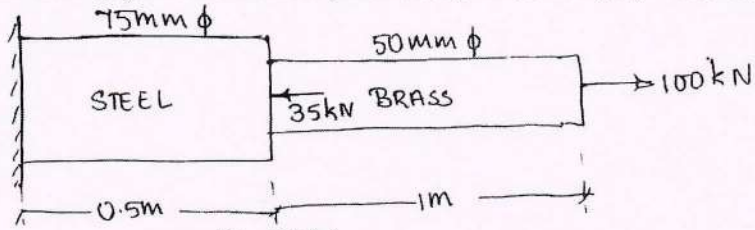

Fig.Q1(b) **(10 Marks)**

OR

2 a. A compound bar made of steel plate 60 mm wide and 10 mm thick to which a copper plate 60 mm wide and 5 mm thick are rigidly connected to each other. The length of the bar is 0.7 m. If the temperature is raised by 80°C. Determine the stress in each metal and the change in length.

$E_S = 200$ GPa, $\alpha_S = 12 \times 10^{-6}/°C$; $E_{cu} = 100$ GPa, $\alpha_{cu} = 17 \times 10^{-6}/°C$ **(12 Marks)**

b. Derive an expression for extension of the bar due to its self weight only having area 'A' and length L suspended from its top. **(04 Marks)**

c. Write a note on thermal stresses. **(04 Marks)**

Module-2

3 a. At a certain point in a strained material the stress condition shown in Fig.Q3(a) exists. Find:

(i) The normal and shear stress on the inclined plane AB
(ii) Principal stresses and principal planes
(iii) Maximum shear stresses and their planes

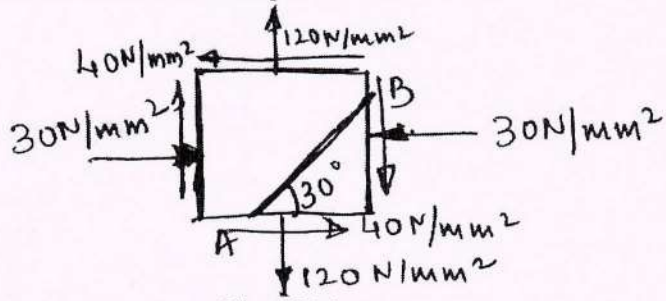

Fig.Q3(a) **(12 Marks)**

b. Derive an expressions for volumetric strain in case of a thin cylindrical shell of diameter 'd' subjected to internal pressure 'p'. **(05 Marks)**

c. Define: (i) Principal stresses (ii) Principal planes **(03 Marks)**

OR

4 a. A cylindrical shell is 3m long 1m internal diameter and is subjected to an internal pressure of 1 N/mm^2. If thickness of the shell is 12mm, find the circumferential stress and longitudinal stress. Also find maximum shear stress and the changes in the dimensions of the shell. Take E = 200 kN/mm^2 and $\mu = 0.3$. **(10 Marks)**

b. A thick metallic cylindrical shell of 150 mm, internal diameter is required to withstand an internal pressure of 8 MPa. Find the necessary thickness of cylinder, if permissible stress of the section is 20 MPa. **(10 Marks)**

Module-3

5 a. Derive relation between shear force, bending moment and load. **(06 Marks)**

b. Calculate SF and BM at salient points and draw SFD and BMD for the beam shown in Fig.Q5(b).

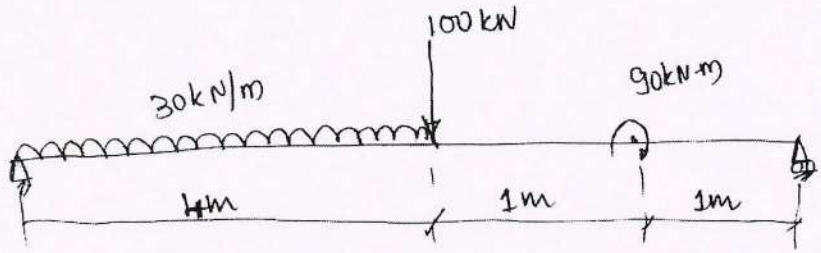

Fig.Q5(b) **(14 Marks)**

OR

6 a. Define: (i) Bending moment (ii) Shear force **(04 Marks)**

b. Draw SFD and BMD for beam shown in Fig.Q6(b).

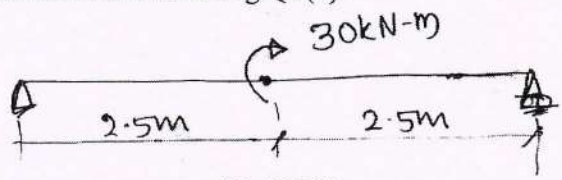

Fig.Q6(b) **(06 Marks)**

c. Draw SFD and BMD for simply supported beam of length L with point load 'P' placed at a distance 'a' from right support and 'b' from left support. **(10 Marks)**

Module-4

7 a. Define: (i) Torsional strength (ii) Torsional stiffness (iii) Torsional rigidity **(06 Marks)**

b. A shaft transmits 300 KW power at 120 rpm. Determine:

(i) The necessary diameter of solid circular shaft.

(ii) The necessary outer diameter of hollow circular section such that the inner diameter being 2/3 of the outer diameter. Take allowable shear stress as 70 N/mm^2. **(14 Marks)**

OR

8 Write short notes on any four:

a. Maximum principal stress theory

b. Maximum shear stress theory

c. Maximum principal strain theory

d. Maximum strain energy theory

e. Maximum shear strain energy theory **(20 Marks)**

Module-5

9 a. Show that for a rectangular cross section maximum shear stress is 1.5 times average shear stress. **(06 Marks)**

b. A simply supported beam of span 6 m has a cross section as shown in Fig.Q9(b). It carries 2 point loads each of 30 kN at a distance of 2m from each support. Calculate the bending stress and shear stress for maximum values of bending moment and shear force respectively. Draw neat diagram of bending stress and shear stress distribution across the cross section.

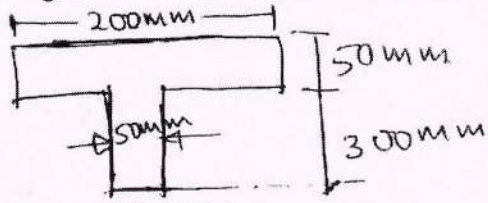

Fig.Q9(b) **(14 Marks)**

OR

10 a. Derive an expression for Euler's buckling load for long column with one end fixed and other end free. **(08 Marks)**

b. The cross section of a column is a hollow rectangular section with its external dimensions 200 mm × 150 mm. The internal dimension are 150 × 100 mm. The column is 5m long and fixed at both ends. If E = 120 GPa, calculate the critical load using Euler's formula. Compare the above load with the value obtained from Rankine's formula. The permissible compressive stress is 500 N/mm^2. The Rankine's constant is 1/6000. **(12 Marks)**

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CBCS SCHEME

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17CV33

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Fluid Mechanics

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define the following fluid properties. Also mention their units.
i) Specific Gravity ii) Viscosity iii) Mass Density iv) Specific Volume. **(06 Marks)**

b. Define capillarity and derive expressions for capillary rise and capillary fall. **(06 Marks)**

c. A differential manometer is connected at the two points A and B of two pipes as shown in Fig.Q.1(c). The pipe A contains a liquid of specific gravity of 1.5, while pipe B contains a liquid of specific gravity of 0.9. The pressures at A and B are 1kgf/cm^2 and 1.8kgf/cm^2 respectively. Find the difference is mercury level in the differential manometer. **(08 Marks)**

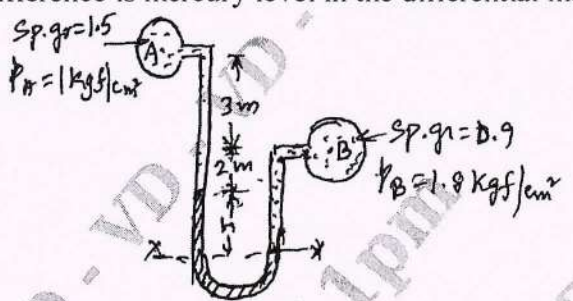

Fig.Q.1(c)

OR

2 a. With neat sketch, explain Bourdon tube pressure gauge. **(06 Marks)**

b. State and prove hydrostatic law of pressure. **(06 Marks)**

c. The dynamic viscosity of an oil used for lubrication between a shaft and sleeve is 0.6N.sec/m^2. The shaft is of diameter 0.4m and rotates at 190rpm. Calculate the power lost in the bearing for a sleeve length of 90mm. The thickness of the oil film is 1.5mm. **(08 Marks)**

Module-2

3 a. Define total pressure and centre of pressure. Also derive expressions for total pressure and centre of pressure for a plane surface submerged vertically in a liquid. **(08 Marks)**

b. Distinguish between:
i) Laminar Flow and turbulent flow
ii) Uniform flow and non uniform flow
iii) Steady flow and unsteady flow. **(06 Marks)**

c. Determine the total pressure and centre of pressure on an isosceles triangular plate of base 4m and altitude 4m when it is immersed vertically in an oil of specific gravity 0.9. The base of the plate coincides with the free surface of oil. **(06 Marks)**

OR

4 a. Derive the three dimensional continuity equation in the Cartesian coordinates. **(06 Marks)**

b. The velocity vector n a fluid flow is given as $V = 4x^3i - 10x^2yj + 2tk$. Find the velocity and acceleration of a fluid particle at (2, 1, 3) at time t =1. **(08 Marks)**

c. Determine the total pressure on a circular plate of diameter 1.5m which is placed vertically in water in such a way that the centre of the plate is 3m below the free surface of water. Find the position of centre of pressure also. **(06 Marks)**

Module-3

5 a. Define free vortex flow and forced vortex flow. Also mention two examples for each. **(04 Marks)**

b. Derive Euler's equation of motion along a stream line and obtain Bernoulli's equation from Euler's equation. Also mention the assumptions made in derivation. **(10 Marks)**

c. A 30cm × 15cm venturimeter is inserted on a vertical pipe carrying water, flowing in upward direction. A differential mercury manometer connected to the inlet and throat gives a reading of 20cm. Find the discharge. Take $C_d = 0.98$. **(06 Marks)**

OR

6 a. Derive an expression for discharge through a venturimeter. **(06 Marks)**

b. List the various instruments that works on the Bernoullie's principle. Also explain how pilot tube is used to measure velocity of flow. **(06 Marks)**

c. A 300mm diameter pipe carries water under a head of 20m with a velocity of 3.5m/s. If the axis of the pipe turns through 45°, find the magnitude and direction of the resultant force on the bend. **(08 Marks)**

Module-4

7 a. Give a detailed note on classification of orifices mouth pieces. **(06 Marks)**

b. Derive an expression for discharge through a Borda's mouth piece running free. **(06 Marks)**

c. Water flows over a rectangular weir 1m wide at a depth of 150mm and afterwards passes through a triangular right angled weir. Taking C_d for the rectangular weir and triangular weir as 0.62 and 0.59 respectively. Find the depth over triangular weir. **(08 Marks)**

OR

8 a. Give a detailed note on classification of weirs. Derive an expression for discharge through a triangular notch. **(10 Marks)**

b. Define hydraulic coefficients. Also mention the general values of hydraulic coefficients. **(06 Marks)**

c. A jet of water, issuing from a sharp edged vertical orifice under a constant head of 10cm at a certain point, has the horizontal and vertical coordinates measured from the vena-contracta as 20cm and 10.5cm respectively. Find the value of C_v and also value of C_c if $C_d = 0.6$. **(04 Marks)**

Module-5

9 a. Give a brief note on loss of energy in pipes. Also derive Darcy's Weisbach equation for loss of energy due to friction. **(10 Marks)**

b. Give a brief note on water harmer in pipes. **(04 Marks)**

c. Three pipes of lengths 800m, 500m and 400m and diameters 500mm, 400mm and 300mm respectively are connected in series. These pipes are to be replaced by a single pipe of length 1700m. Find the diameter of the single pipe. **(06 Marks)**

OR

10 a. Derive an expression for the loss of head due to sudden enlargement of pipe section. **(08 Marks)**

b. The water is flowing with a velocity of 1.5m/s in a pipe of length 2500m and of diameter 500mm. At the end of the pipe, a valve is provided. Find the rise in pressure if the valve is closed in 25 seconds. Take the value of C = 1460m/s. **(06 Marks)**

c. An oil of specific gravity 0.7 is flowing through a pipe of diameter 300mm at the rate of 500*l*/s. Find the head lost due to friction and power required to maintain the flow for a length of 1000m. Take $\gamma = 0.29$ stokes. **(06 Marks)**

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CBCS SCHEME

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17CV34

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Basic Surveying

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain classification of Surveying in detail. **(10 Marks)**

b. Explain principles of Surveying in detail. **(06 Marks)**

c. Distinguish between Plane and Geodetic survey. **(04 Marks)**

OR

2 a. Discuss accessories required for horizontal measurements in detail. **(10 Marks)**

b. To measure a base line, a steel tape 30m long standardized at 15°C with a pull of 100N was used. Find the correction per tape length if the temperature at the time of measurement was 20°C and the pull exerted was 160 N. If the length of 250m is measured on a slope of 1 in 4, find the horizontal length. Take $E = 2.1\times10^5$ N/mm^2 ; $\alpha = 11.2\times10^{-6}$/°C and cross-sectional area of tape = 0.08 cm^2. **(10 Marks)**

Module-2

3 a. Define Local attraction? How it defected? Explain. **(06 Marks)**

b. Distinguish between Prismatic compass and Surveyor's compass. **(04 Marks)**

c. Determine the bearings of sides of regular pentagon of sides 5m, if the bearing of the first line AB is 80°. **(10 Marks)**

OR

4 a. Explain the temporary adjustment of transit theodolite in detail. **(10 Marks)**

b. Discus the methods of Repetition and reiteration for measuring horizontal angle in detail with neat sketch. **(10 Marks)**

Module-3

5 a. What is meant by balancing of Traverse? Explain the Bowditch method of adjusting the traverse. **(10 Marks)**

b. In a closed traverse ABCDE, the length and bearings of EA has been omitted. Compute the length and bearing of the line EA.

Line	Length (m)	Bearing
AB	204	87° 30′
BC	226	20° 20′
CD	187	280° 0′
DE	192	210° 3′
EA	?	?

(10 Marks)

OR

6 a. Derive the distance and elevation formulae for stadia tachometry, when the staff is held vertical and the line of sight being inclined upwards and downwards with neat sketch. **(10 Marks)**

b. A tacheometer, fitted with an anallactic lens and having the multiplying constant 100, was setup at station C to determine the gradient between two points A and B and the following observations were taken, keeping the staff vertical.

Staff at	Vertical angle	Stadia readings
A	+4° 20′ 0″	1.300, 1.610, 1.920
B	+0° 10′ 40″	1.100, 1.410, 1.720

(10 Marks)

Module-4

7 a. The following readings were observed successively with a levelling instrument. The instrument was shifted after 5th and 11th readings.
0.585, 1.010, 1.735, 3.295, 3.775, 0.350, 1.300, 1.795, 2.575, 3.375, 3.895, 1.735, 0.635 and 1.605m.
Draw up a page of level book and determine the RL of various points if RL of first point is 136.440m. Use Rise and Fall method. **(10 Marks)**

b. Enumerate the errors in leveling in detail. **(10 Marks)**

OR

8 a. Derive an equation to determine the difference in elevation of the instrument station and top of a Chimney using Double plane method. **(10 Marks)**

b. The following observations were made on a hill top to ascertain its elevation. The height of the target F was 5m. The instrument stations were 100m apart and were in line with F.

Instrument Station	Staff reading on BM	Vertical angle	Remarks
01	2.550	18° 6′	RL of BM
02	1.670	28° 42′	= 345.580 m

(10 Marks)

Module-5

9 a. A railway embankment of formation width 10m is to be built with side slope of 1 vertical to 2 horizontal. The ground is horizontal in the direction transverse to the centre line. Length of embankment is 150m. The centre height of embankment at 25m intervals are as given below:
1.8, 3.3, 3.6, 4.2, 2.9, 2.6, 2.2m
Calculate the volume of earth filling. **(10 Marks)**

b. Explain the method of computation of volume by the
(i) Trapezoidal rule (ii) Prismoidal rule **(10 Marks)**

OR

10 a. Explain characteristics of contours with neat sketches. **(10 Marks)**

b. Discuss the uses of contour maps for various Civil engineering works with sketches. **(10 Marks)**

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CBCS SCHEME

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17CV42

Fourth Semester B.E. Degree Examination, Jan./Feb.2021
Analysis of Determinate Structures

Time: 3 hrs. Max. Marks: 100

Note: 1. ***Answer any FIVE full questions, choosing ONE full question from each module.***
2. ***Assume any missing data, if any.***

Module-1

1 a. Explain different forms of structures with examples. **(04 Marks)**

b. Distinguish between determinate and indeterminate structures with examples. **(04 Marks)**

c. Find the forces in all the members of the truss shown in Fig. Q1 (c) and tabulate it. **(12 Marks)**

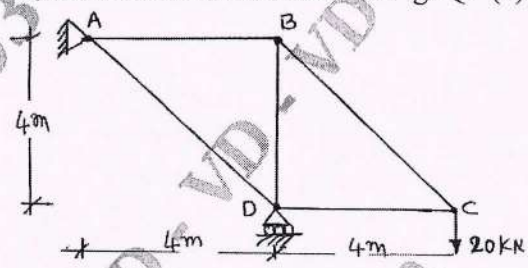

Fig. Q1 (c)

OR

2 a. List the assumptions made in the analysis of pin jointed plane truss. **(04 Marks)**

b. Determine the static and kinematic indeterminancy for the structures shown in Fig. Q2 (b). **(06 Marks)**

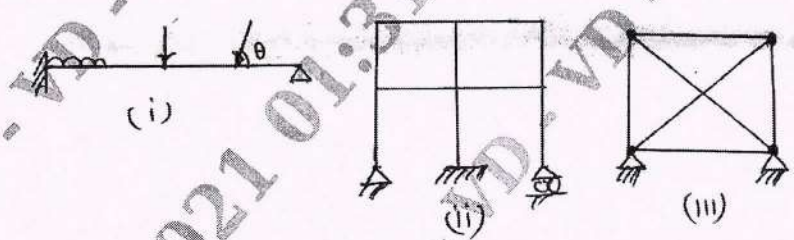

Fig. Q2 (b)

c. Find the forces in the members DE, DF and EF of the truss shown in Fig. Q2 (c) by method of sections. **(10 Marks)**

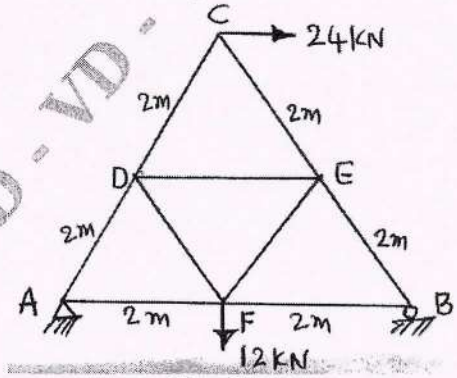

Fig. Q2 (c)

Module-2

3 a. Derive the differential equation of deflection curve for the beam. **(06 Marks)**

b. State conjugate beam theorems. **(04 Marks)**

c. Find deflection at 'C' and slope at A and B for the beam shown in Fig. Q3 (c) using moment area method. **(10 Marks)**

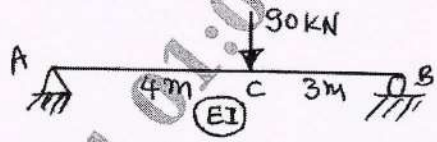

Fig. Q3 (c)

OR

4 a. State and prove moment area theorems. **(06 Marks)**

b. Find deflection at end of the Cantilever beam of span 'L' carrying udl of w/m runover entire span. Take EI constant using conjugate beam method. **(04 Marks)**

c. Find deflection at the load points C and D for the simply supported beam shown in Fig. Q4 (c) using Maculay's method. Take EI = 12000 kN-m^2 **(10 Marks)**

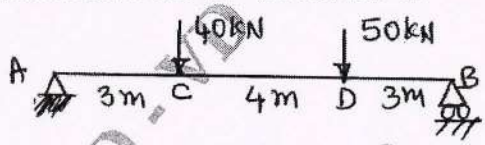

Fig. Q4 (c)

Module-3

5 a. State and prove in Castigliano's theorem – 1. **(06 Marks)**

b. State the principle of virtual forces. **(04 Marks)**

c. Determine the deflection at 'C' of the beam shown in Fig. Q5 (c) using strain energy method. **(10 Marks)**

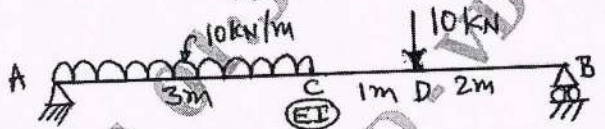

Fig. Q5 (c)

OR

6 a. Derive the expression for the strain energy stored in a beam due to flexure. **(06 Marks)**

b. Distinguish between strain energy and complimentary energy. **(04 Marks)**

c. Determine the horizontal deflection at 'C' of the truss loaded as shown in Fig. Q6 (c) using unit load method. All the members have same cross sectional area of 1500 mm^2 and E = 200 GPa. **(10 Marks)**

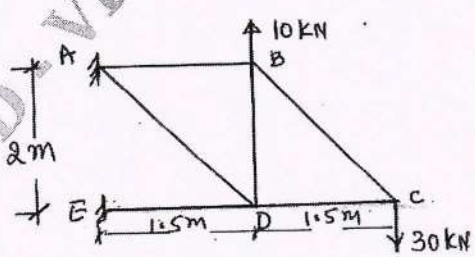

Fig. Q6 (c)

Module-4

7 a. A three hinged parabolic area has a span of 24 m and a central rise of 4 m. It carries concentrated loads of 75 kN at 18 m from the left support and udl of 45 kN/m over the left half of the portion. Determine the moment, normal thrust and radial shear at a distance 6 m from the left support. **(12 Marks)**

b. A cable used to support two loads of 40 kN and 40 kN across a span of 60 m. The cable length is 62 m. The loads acting at 20 m from left and right support. Find the tension in various segments of the cable shown in Fig. Q7 (b). **(08 Marks)**

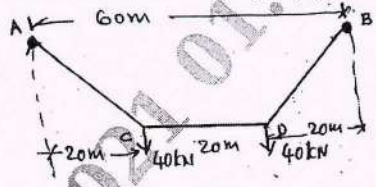

Fig. Q7 (b)

OR

8 a. A cable is suspended from two points A and B which are 80 m apart. A is 5 m below B. The lowest point on the cable is 10 m below A. The cable supports a udl of 20 kN/m over entire span. Calculate (i) reactions at supports (ii) Maximum tension in cable. **(08 Marks)**

b. A three hinged parabolic arch of span 50 m has its supports at depth 4m and 16 m below crown shown in Fig. Q8 (b). Determine reactions at the supports and bending moments under the loads. Also draw BMD. **(12 Marks)**

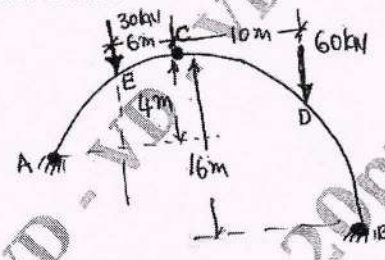

Fig. Q8 (b)

Module-5

9 a. Draw ILD for SF and BM at a section 3 m from left support for a S.S beam of span 12 m. Calculate maximum SF and BM at this section due to rolling load 5 m long and 2 kN/m intensity. **(08 Marks)**

b. A series of wheel loads crosses over a girder of span 15 m from left to right with 40 kN load leading as shown in Fig. Q9 (b). Determine maximum BM and SF at a section 4 m from left support. **(12 Marks)**

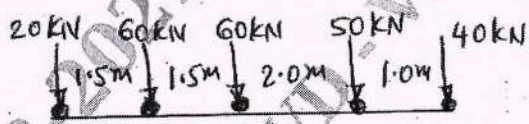

Fig. Q9 (b)

OR

10 a. Draw influence line diagram for shear force at any section from first principles. **(04 Marks)**

b. What is influence line and state the importance of influence lines? **(04 Marks)**

c. A train of five wheel loads crosses a simply supported beam of span 30 m as shown in Fig. Q10 (c). Calculate maximum positive and negative SF at midspan and absolute maximum BM anywhere in the span. **(12 Marks)**

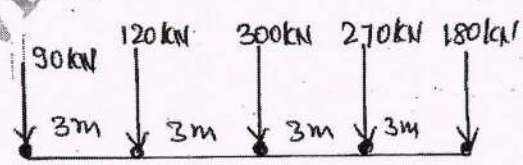

Fig. Q10 (c)

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17CV43

Fourth Semester B.E. Degree Examination, Jan./Feb. 2021
Applied Hydraulics

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define dimensional homogeneity. Give two examples. **(04 Marks)**

b. Explain how repeating variables are selected for dimensional analysis in π-theorem. Also state π-theorem. **(06 Marks)**

c. The frictional torque T of a disc of diameter D rotating at a speed N in a fluid of viscosity μ and density ρ in a turbulent flow is given by

$$T = D^5N^2\rho\phi\left(\frac{\mu}{D^2N\rho}\right).$$

Prove this by Buckingham's π - theorem. **(10 Marks)**

OR

2 a. Define (i) Metacentric height (ii) Buoyancy (iii) Prototype (iv) Similitude. **(08 Marks)**

b. What do you understand by Froude model law? Mention its applications. Derive any 5 scale ratios for physical quantities based on Froude model law. **(12 Marks)**

Module-2

3 a. Derive Chezy's equation for flow through an open channel. Bring out relation between N and C. **(10 Marks)**

b. A trapezoidal channel has to carry 142 m^3/minute of water is designed to have a minimum cross section. Find the bottom width and depth of the bed slope is 1 in 1200, the side slopes at 45° and Chezy's coefficient is 55. **(10 Marks)**

OR

4 a. What is specific energy? Define and draw specific energy curve and also derive expressions for critical depth and critical velocity. **(10 Marks)**

b. The discharge of water through a rectangular channel of width 6m is 18 m^3/sec when depth of flow of water is 2m. Calculate

(i) Specific energy of the flowing water
(ii) Critical depth and critical velocity
(iii) Value of minimum specific energy
(iv) State whether the flow is subcritical or supercritical. **(10 Marks)**

Module-3

5 a. Explain the term hydraulic jump with a neat sketch. Derive an expression for loss of energy due to hydraulic jump. **(10 Marks)**

b. A sluice gate discharges water into a horizontal rectangular channel with a velocity of 6 m/s and depth of flow is 0.4m. The width of the channel is 8m. Determine whether a hydraulic jump will occur and if so, find its height and loss of energy per kg of water. Also find power lost in the hydraulic jump. **(10 Marks)**

OR

6 a. With a neat sketch, explain what is back water curve and afflux. Derive an expression for length of backwater curve. **(10 Marks)**

b. Find the slope of the free water surface in a rectangular channel of width 15m having depth of flow 4m. Discharge through channel is 40 m^3/sec. Bed of channel is having a slope of 1 in 4000. Take Chezy's C = 50. **(10 Marks)**

Module-4

7 a. With a neat sketch explain the concept of velocity triangles. **(10 Marks)**

b. A jet of water having a velocity of 35 m/s impinges on a series of vanes moving with a velocity of 20 m/s. The jet makes an angle of 30° to direction of motion of vanes when entering and leaves at 120.

(i) Draw velocity Δ^{les} at inlet and outlet

(ii) Find angles of vane tips so that water enters and leaves without shock.

(iii) Work done per unit wt. of water entering the vanes. **(10 Marks)**

OR

8 a. Draw a typical layout of a hydroelectric plant and explain various heads. **(10 Marks)**

b. A Pelton wheel is to be designed for following specifications:
Shaft power = 11,772 kW ; Head = 380 m ; Speed = 750 rpm ; Overall efficiency = 86% ; Jet diameter not to exceed $1/6^{th}$ of wheel ϕ. Determine (i) Wheel diameter (ii) No. of Jets. **(10 Marks)**

Module-5

9 a. Define Draft Tube. Explain the draft tube theory with a sketch. **(10 Marks)**

b. Draw Kaplan turbine and label the parts legibly. Give the working proportions. **(10 Marks)**

OR

10 a. With the help of a neat sketch, explain main parts of a centrifugal pump. **(07 Marks)**

b. The diameter of an impeller of a centrifugal pump at inlet and outlet are 30cm and 60 cm respectively. The velocity of flow at outlet is 2.0 m/s and the vanes are set back at an angle of 45° at the outlet. Determine the minimum starting speed of the pump of manometer η is 70%. **(08 Marks)**

c. Write a short note on multistage pumps. **(05 Marks)**

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CBCS SCHEME

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17CV43

Fourth Semester B.E. Degree Examination, Jan./Feb. 2021
Applied Hydraulics

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define dimensional homogeneity. Give two examples. **(04 Marks)**

b. Explain how repeating variables are selected for dimensional analysis in π-theorem. Also state π-theorem. **(06 Marks)**

c. The frictional torque T of a disc of diameter D rotating at a speed N in a fluid of viscosity μ and density ρ in a turbulent flow is given by

$$T = D^5 N^2 \rho \phi\left(\frac{\mu}{D^2 N \rho}\right).$$

Prove this by Buckingham's π - theorem. **(10 Marks)**

OR

2 a. Define (i) Metacentric height (ii) Buoyancy (iii) Prototype (iv) Similitude. **(08 Marks)**

b. What do you understand by Froude model law? Mention its applications. Derive any 5 scale ratios for physical quantities based on Froude model law. **(12 Marks)**

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3 a. Derive Chezy's equation for flow through an open channel. Bring out relation between N and C. **(10 Marks)**

b. A trapezoidal channel has to carry 142 m^3/minute of water is designed to have a minimum cross section. Find the bottom width and depth of the bed slope is 1 in 1200, the side slopes at 45° and Chezy's coefficient is 55. **(10 Marks)**

OR

4 a. What is specific energy? Define and draw specific energy curve and also derive expressions for critical depth and critical velocity. **(10 Marks)**

b. The discharge of water through a rectangular channel of width 6m is 18 m^3/sec when depth of flow of water is 2m. Calculate

(i) Specific energy of the flowing water
(ii) Critical depth and critical velocity
(iii) Value of minimum specific energy
(iv) State whether the flow is subcritical or supercritical. **(10 Marks)**

Module-3

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OR

6 a. With a neat sketch, explain what is back water curve and afflux. Derive an expression for length of backwater curve. **(10 Marks)**

b. Find the slope of the free water surface in a rectangular channel of width 15m having depth of flow 4m. Discharge through channel is 40 m^3/sec. Bed of channel is having a slope of 1 in 4000. Take Chezy's C = 50. **(10 Marks)**

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b. A jet of water having a velocity of 35 m/s impinges on a series of vanes moving with a velocity of 20 m/s. The jet makes an angle of 30° to direction of motion of vanes when entering and leaves at 120°.

(i) Draw velocity Δ^{les} at inlet and outlet

(ii) Find angles of vane tips so that water enters and leaves without shock.

(iii) Work done per unit wt. of water entering the vanes. **(10 Marks)**

OR

8 a. Draw a typical layout of a hydroelectric plant and explain various heads. **(10 Marks)**

b. A Pelton wheel is to be designed for following specifications:
Shaft power = 11,772 kW ; Head = 380 m ; Speed = 750 rpm ; Overall efficiency = 86% ; Jet diameter not to exceed $1/6^{th}$ of wheel ϕ. Determine (i) Wheel diameter (ii) No. of Jets. **(10 Marks)**

Module-5

9 a. Define Draft Tube. Explain the draft tube theory with a sketch. **(10 Marks)**

b. Draw Kaplan turbine and label the parts legibly. Give the working proportions. **(10 Marks)**

OR

10 a. With the help of a neat sketch, explain main parts of a centrifugal pump. **(07 Marks)**

b. The diameter of an impeller of a centrifugal pump at inlet and outlet are 30cm and 60 cm respectively. The velocity of flow at outlet is 2.0 m/s and the vanes are set back at an angle of 45° at the outlet. Determine the minimum starting speed of the pump of manometer η is 70%. **(08 Marks)**

c. Write a short note on multistage pumps. **(05 Marks)**

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CBCS SCHEME

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17CV45

Fourth Semester B.E. Degree Examination, Jan./Feb. 2021
Basic Geotechnical Engineering

Time: 3 hrs. Max. Marks: 100

Note: 1. ***Answer any FIVE full questions, choosing ONE full question from each module.***
2. ***Missing data if any, may be suitably assumed.***

Module-1

1 a. Sketch the phase diagram for a soil and indicate the volumes and weights of the phases on it. Define : Void ratio , Degree of saturation and Water content. **(10 Marks)**

b. What is the purpose of soil classification? Describe any three methods of field identification of soils. **(10 Marks)**

OR

2 a. Describe the laboratory method of determining the plastic limit and shrinkage limit of a soil. **(10 Marks)**

b. A soil sample with specific gravity of solids 2.70 has a mass specific gravity of 1.84. Assuming the soil to the perfectly dry, determine the void ratio. **(05 Marks)**

c. Describe the processes of soil formation. **(05 Marks)**

Module-2

3 a. Define 'Structure of a soil'. With neat sketches, describe the different types of structures of soil. **(10 Marks)**

b. With a neat sketch, explain the electrical diffuse double layer theory. **(10 Marks)**

OR

4 a. Discuss on the factors that influence the compaction of soils. Indicate their influence with illustrative sketches of compaction curves. **(10 Marks)**

b. Write a note on 'Proctor's Needle' and its use in field compaction control. **(04 Marks)**

c. Discuss the different compacting equipments used for compacting the soil in field. **(06 Marks)**

Module-3

5 a. List and explain the various factors that affect the permeability of a soil. **(10 Marks)**

b. The discharge of water collected from a constant head permeameter in 15 minutes is 500mℓ. The internal diameter of permeameter is 5cm and the measured difference in head between two gauging points 15cm vertically apart is 40cm. Calculate the co-efficient of permeability. If the dry weight of the 15cm long sample is 4.86N and the specific gravity of the solid is 2.65. Calculate the seepage velocity. **(10 Marks)**

OR

6 a. Define Darcy's Law. Derive the Laplace equation for seepage flow. **(10 Marks)**

b. A deposit of cohesionless soil with a permeability of 10^{-4} m/s has a depth of 6m with an impervious rock below. A sheet pile wall is driven into this deposit to a depth of 3m. The wall extends above the surface of the soil by 3m and 3m depth of water acts on one side and water level on the other side is 6.5m above the impervious rock. Sketch the flow net and determine the seepage quantity per meter length of the wall. **(05 Marks)**

c. What is a Flow net? What are its characteristics and uses? **(05 Marks)**

Module-4

7 a. Explain the method of determination of coefficient of consolidation by Logarithmic time method. **(07 Marks)**

b. With a neat sketch, explain Casagrande method of determination of preconsolidation pressure. **(07 Marks)**

c. In a consolidation teat, the void ratio of soil sample decreases from 1.20 to 1.10, when the pressure increases from 160 kN/m^2 to 320 kN/m^2. Determine the coefficient of consolidation, if $K = 8 \times 10^{-7}$ mm/s. **(06 Marks)**

OR

8 a. Explain the Mass – Spring Analogy theory of consolidation as applied to saturated clay soils. **(07 Marks)**

b. Explain normally consolidated, under consolidation and over consolidated soils. **(06 Marks)**

c. There is a bed of compressible clay of 4m thickness with pervious sand on top and impervious rock at the bottom. In a consolidation test on an undisturbed specimen of clay from this deposit, 90% settlement was reached in 4 hrs. The specimen was 20mm thick. Estimate the time in years for the building founded over this deposit to reach 90% of its final settlement. **(07 Marks)**

Module-5

9 a. Enumerate the various laboratory and field tests employed for determining shear strength of soil. Explain the triaxial compression test. **(10 Marks)**

b. What do you mean by sensitivity and thixotrophy in soils? **(04 Marks)**

c. The stresses at failure on failure plane in a cohesionless soil mass are : Shear stress = $4kN/m^2$ and Normal stress = $10kN/m^2$. Determine the resultant stress on the failure plane, the angle of internal friction of soil and the angle of inclination of failure plane to the major principle plane. **(06 Marks)**

OR

10 a. Explain the types of shear tests based on drainage conditions. **(06 Marks)**

b. With a neat sketch, explain total and effective stress paths. **(06 Marks)**

c. The results of shear box test are as follows :

Trail no	1	2	3	4
Normal stress, kN/m^2	50	100	200	300
Shear stress kN/m^2	36	80	154	235

Determine the shear parameters. Will the failure occur on the plane within the soil mass, when shear stress is 154 kN/m^2 and normal stress is $200kN/m^2$? **(08 Marks)**

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CBCS SCHEME

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17CV46

Fourth Semester B.E. Degree Examination, Jan./Feb. 2021
Advanced Surveying

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. List the different methods of setting out simple circular curves. Explain the angular method of setting out simple circular curve by Rankines method of deflection angles. **(10 Marks)**

b. Two tangents intersect at a chainage 1000mt, the deflection angle being 28°. Calculate the necessary data to setout a simple circular curve of 200mt radius by Rankine's method of deflection angles. Take per interval as 10mt. **(10 Marks)**

OR

2 a. What is a transition curve? List the functions and essential requirements of an ideal transition curve. **(06 Marks)**

b. Two straight with a total deflection angle of 72° are to be connected by a compound curve of two branches of equal length. The Radius of the first branch is 300mt and that of the second branch is 400mt, chainage at intersection point is 1500mt. Calculate the chainages of tangent points and that of Point of Compound Curvature (PCC). **(08 Marks)**

c. Two parallel railway lines are to be connected by a reverse curve of different radii. If the lines are 10mt apart and maximum distance between tangent points measured parallel to the straight is 45mt, calculate the Radius of the second branch if that at first branch is 65mt, calculate the length at both the branches. **(06 Marks)**

Module-2

3 a. List the various factors, that are to be considered in the selection at site for base line and stations in triangulation survey. **(06 Marks)**

b. Write a note on classification of triangulation system. **(06 Marks)**

c. From an eccentric station S, 12.25mt to the west of the main station B, the following angles were measured

$\angle BSC = 76°25'32''$ $\angle CSA = 54°32'20''$

The stations S and C are to the opposite sides at the line AB, calculate the correct angle ABC, if the lengths AB and BC are 5286.5 and 4932.2m respectively. **(08 Marks)**

OR

4 a. State and explain laws of weights. **(08 Marks)**

b. The following are the mean valves observed in the measurement of three angles α, β and γ at one station.

$\alpha = 76°42'46''.2$ with weight 4

$\alpha + \beta = 134°36'32''.6$ with weight 3

$\beta + \gamma = 185°35'24''.8$ with weight 2

$\alpha + \beta + \gamma = 262°18'10''.4$ with weight 1

Calculate the most probable value of each angle. **(12 Marks)**

Module-3

5 a. Define the following terms:
   i) The Celestial sphere
   ii) The azimuth
   iii) The sensible horizon
   iv) The hour angle. **(08 Marks)**

   b. Find the G.M.T corresponding to the following LMT:
   i) 9h 10m 12s A.M at a place in longitude 42°36′W
   ii) 4h 32m 10s A.M, at a place in longitude 56°32′E **(12 Marks)**

OR

6 a. Define the following terms:
   i) Zenith and Wadir
   ii) The visible horizon
   iii) The prime vertical
   iv) The hour angle **(08 Marks)**

   b. The standard time meredian in India is 82°30′E. If the standard time at any instant is 20 hours 24 minutes 6 seconds, find the local mean time for two places having longitudes i) 20°E ii) 20°W. **(12 Marks)**

Module-4

7 a. Define the following terms:
   i) Vertical photograph
   ii) Flying height
   iii) Perspective projecting
   iv) Exposure station **(08 Marks)**

   b. A vertical photograph was taken at an altitude of 1200 meters above mean sea level. Determine the scale of the photograph for terrain lying at elevations of 80meters and 300meter if the focal length of the camera is 15cm. **(12 Marks)**

OR

8 a. List the reasons for keeping overlap in photographs. **(08 Marks)**

   b. Describe how mosaic differs from a map. **(06 Marks)**

   c. A section line AB appears to be 10.16cm on a photograph for which the focal length is 16cm. The corresponding line measures 2.54cm on a map which is to a scale 1/50,000. The terrain has an average elevation of 200m above mean sea level. Calculate the flying altitude at the aircraft, above mean sea level, when the photograph was taken. **(06 Marks)**

Module-5

9 a. Define Remote sensing. List the applications in Civil Engineering. **(10 Marks)**

   b. What is GIS? With a neat sketch, explain the components of GIS. **(10 Marks)**

OR

10 a. What is GPS? Explain the basic principles of GPS and its application in surveying. **(10 Marks)**

   b. Explain the working principle of total stations and list the salient features of total station. **(10 Marks)**

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CBCS SCHEME

USN | | | | | | | | | | |

15CV42

Fourth Semester B.E. Degree Examination, Jan./Feb. 2021
Analysis of Determinate Structures

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Determine static and Kinematic in determinacies of the structures shown in Fig Q1(a) i), ii), iii).

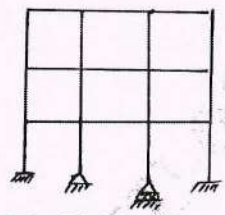

Fig Q1(a) – i)

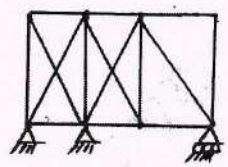

Fig Q1(a) – ii)

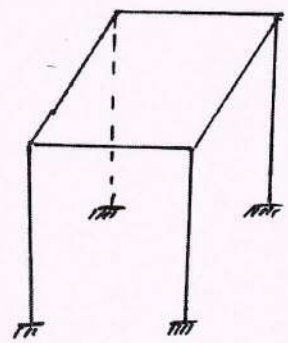

Fig Q1(a) – iii) **(08 Marks)**

b. Determine the forces in the numbered members of the loaded truss shown in Fig Q1(b) using method of sections.

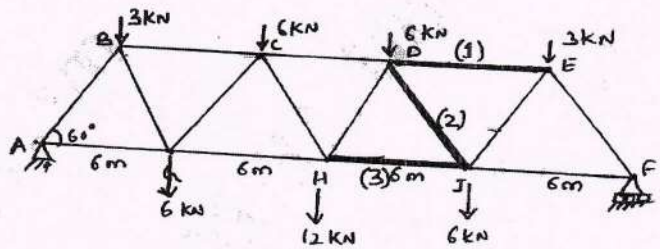

Fig Q1(b) **(08 Marks)**

OR

2 Determine forces in all the members of the truss shown in Fig Q2 using method of joints.

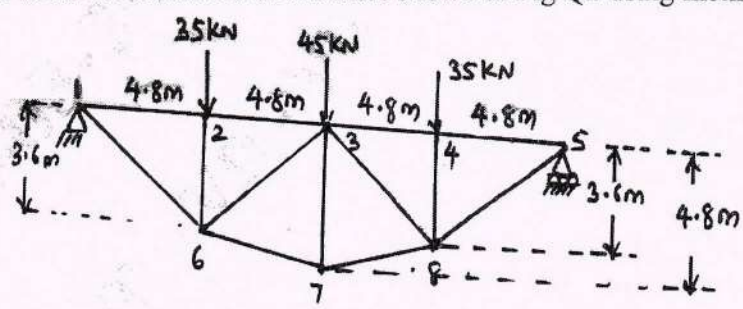

Fig Q2 **(16 Marks)**

Module-2

3 a. Determine maximum slope and maximum deflection for a simply supported beam subjected to a uniformly distributed load (throughout its span) using Double Integration method. **(06 Marks)**

b. Determine maximum slope and maximum deflection for the beam shown in Fig Q3(b) using Macaulay's method.

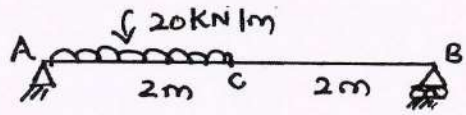

Fig Q3(b) **(10 Marks)**

OR

4 a. Obtain expression for maximum slope and maximum deflection for a Cantilever with a uniformly distributed load throughout its span, using moment-area method. **(06 Marks)**

b. Using Conjugate beam method determine maximum slope and maximum deflection for the simply supported beam shown in Fig Q4(b). $E = 204 \times 10^6$ kN/m^2 and $I = 50 \times 10^{-6}$m^4.

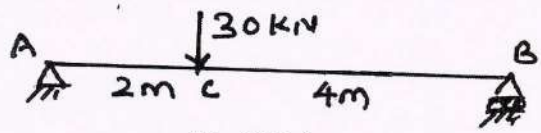

Fig Q4(b) **(10 Marks)**

Module-3

5 a. Determine vertical and horizontal deflections of the bent shown in Fig Q5(a), using Castigliano's method.

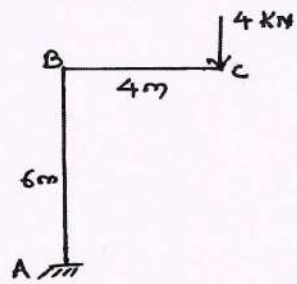

Fig Q5(a) **(12 Marks)**

b. Determine the expression strain energy stored in a member due to flexure, with usual notations. **(04 Marks)**

OR

6 Determine the vertical deflection at the free end of the truss shown in Fig Q6, using unit load method. The cross sectioned areas of members AD and DE are 1500mm^2, while those of other members are 1000mm^2. Take E = 200 kN/mm^2.

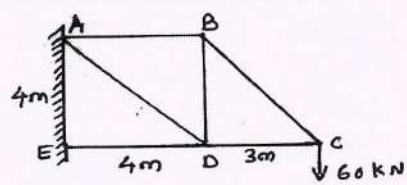

Fig Q6 **(16 Marks)**

Module-4

7 a. A three hinged parabolic arch of span 12m and central rise 3m is subjected to a uniformly distributed load of 30kN/m over its left half portion. Determine vertical reactions and horizontal thrust at the supports. Also determine Bending moment, Normal Thrust and Radial Shear at 3m from the left-hand support. **(12 Marks)**

b. A suspension cable 140m span and 14m central sag, carries a load of 1kN/m. calculate maximum and minimum tension in the cable. Find length of the cable. **(04 Marks)**

OR

8 A three hinged stiffening girder of a suspension bridge, of span 100m is subjected to two concentrated loads of 10kN each, placed at 20m and 40m respectively from the left end support. Determine bending moment and shear force at 30m from the left support. Also determine the maximum and minimum tensions in the supporting cable which has a central dip of 10m. **(16 Marks)**

Module-5

9 a. A simply supported beam has a span of 15m. A uniformly distributed load of 40 kN/m of length 5m passes over the beam from left to right. Using influence line diagram determine maximum bending movement at a section 6m from the left end. **(04 Marks)**

b. Four point loads 16, 30, 30 and 20kN have a centre to centre spacing of 2m between consecutive load and pass over a girder of 30m span from left to right with 20kN load leading. Calculate maximum bending moment and shear force at 8m from the left end, using influence line diagrams. **(12 Marks)**

OR

10 a. A train of concentrated loads shown in Fig Q10(a) move from left to right on a simply supported girder of span 16m. Determine absolute maximum bending moment developed in the beam.

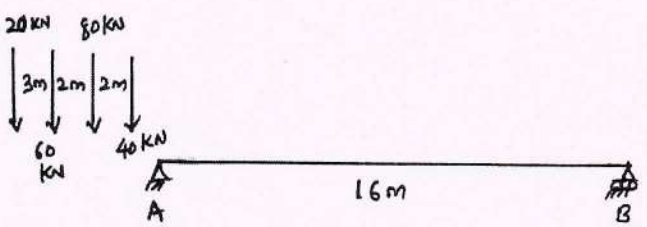

Fig Q10(a) **(08 Marks)**

b. Determine maximum forces in the members CE, DE and DF of the truss shown in Fig Q10(b), due to the dead load of 10 kN/m covering the entire span and a moving load of 20kN/m longer than the span passing over the truss. Consider the loads are transmitted through the lower chord.

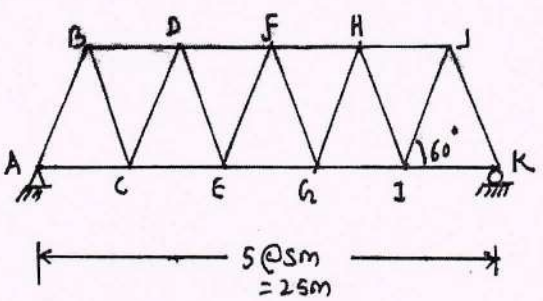

Fig Q10(b) **(08 Marks)**

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CBCS SCHEME

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15CV43

Fourth Semester B.E. Degree Examination, Jan./Feb.2021
Applied Hydraulics

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. State and explain Buckingham π-theorem. **(06 Marks)**

b. Derive the scale ratios of the following as per Reynolds model law:
(i) Time (ii) Discharge (iii) Force (iv) Acceleration
(v) Work (vi) Power **(06 Marks)**

c. A spillway model is constructed such that the velocity and discharge in the model are respectively 2 m/s and 3 m^3/s. If the velocity in the prototype is 20 m/s, what is the length scale ratio and the discharge in the prototype? **(04 Marks)**

OR

2 a. Explain the procedure of determining the metacenter in the laboratory. **(08 Marks)**

b. The efficiency η of a fan depends on density ρ, dynamic viscosity μ of the fluid, angular velocity ω, diameter D of the rotor and discharge Q. Express η as,

$$\eta = \phi\left[\frac{Q}{\omega D^3}, \frac{\mu}{\rho\omega D^2}\right]$$

where ϕ is the function. **(08 Marks)**

Module-2

3 a. Differentiate between:
(i) Hydraulic mean depth and hydraulic depth.
(ii) Steady flow and unsteady flow.
(iii) Critical flow, subcritical flow and supercritical flow. **(06 Marks)**

b. For most economical triangular section, show that crest angle is 90°. **(04 Marks)**

c. Water is flowing through a circular open channel at the rate of 500 lps, when the channel bed slope is 1 in 10000. Manning's n = 0.015. Find the diameter of channel if flow depth is 0.75 times the diameter. **(06 Marks)**

OR

4 a. Define specific energy. Draw specific energy curve and explain salient points. For rectangular channel prove that $E_{min} = 1.5y_c$ at critical flow condition. E_{min} = minimum specific energy, y_c = Critical depth . **(10 Marks)**

b. A concrete lined circular channel of 3.6 m diameter has a bed slope of 1 in 600. Determine velocity and discharge for maximum velocity condition. Chezy's C = 50. **(06 Marks)**

Module-3

5 a. Derive the relationship between sequent depths of hydraulic jump in rectangular jump in terms of approaching Froude number. **(08 Marks)**

b. A horizontal rectangular channel 4 m wide carries a discharge of 16 m^3/s. Determine whether a jump occurs at an initial depth of 0.5 m or not. If a jump occurs, determine the sequent depth and energy loss. **(08 Marks)**

OR

6 a. In a rectangular channel, the Froude number before jump $F_1 = 2.5$. Compute the Froude number after jump. **(04 Marks)**

b. Give the classification of GVF profiles with neat sketches. **(12 Marks)**

Module-4

7 a. Show that for a free jet of water sriking at the center of semicircular vane, the maximum efficiency occurs when vane velocity is $\frac{1}{3}$ of jet velocity and $\eta_{max} = 59.2\%$. **(08 Marks)**

b. A jet of water having velocity 45 m/s impinges without shock on a series of curved vanes moving at 15 m/s, the direction of motion of vanes being 20° to that of jet. The relative velocity at the outlet is 0.9 of that at inlet and the absolute velocity of water at the exit is to be normal to the motion of vanes. Find : (i) Vane angles at entrance and exit
(ii) Hydraulic efficiency. **(08 Marks)**

OR

8 a. Give the classification of turbines based on different criteria. **(08 Marks)**

b. A penstock supplies water form a reservoir to the Pelton wheel with a gross head of 500 m. One third of the gross head is lost in friction in the penstock. The rate of flow of water through the nozzle fitted at the end of the penstock is 2 m^3/s. The angle of deflection of jet is 165° when the vanes are stationary. Determine the power given by the water to the runner and also hydraulic efficiency. Take $C_V = 1.0$ and Speed ratio = 0.45. **(08 Marks)**

Module-5

9 a. Differentiate between :
(i) Francis turbine and Kaplan turbine.
(ii) Unit discharge and actual discharge.
(iii) Unit speed and specific speed. **(06 Marks)**

b. What is draft tube? What are its functions? **(04 Marks)**

c. A centrifugal pump running at 1450 rpm discharges 700 lps against a head of 23 m. If the diameter of the impeller is 250 mm and width is 50 mm, find the vane angle at the outer periphery. Take $\eta_{man} = 75\%$. **(06 Marks)**

OR

10 a. Define minimum starting speed of a centrifugal pump and derive the expression for the same. **(06 Marks)**

b. Define : (i) Suction head, (ii) Delivery head, (iii) Static head
(iv) Manometric head **(04 Marks)**

c. A Kaplan turbine produces 60000 kW power under net head of 25 m with an overall efficiency of 90%. Taking speed ratio = 1.6 and flow ratio = 0.5 with hub diameter = 0.35 times diameter, find the diameter and speed of the turbine. **(06 Marks)**

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CBCS SCHEME

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15CV45

Fourth Semester B.E. Degree Examination, Jan./Feb. 2021
Basic Geo-Technical Engineering

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. With the help of three phase diagram, explain :
i) Void ratio
ii) Porosity
iii) Water content
iv) Degree of saturation. **(08 Marks)**

b. Explain the laboratory procedure to determine the water content present in the soil using hot air oven. **(04 Marks)**

c. An oven dried soil weighing 1.854N is placed in a pyknometer. The total weight of the pyknometer along with soil and water is 15.51N. The pyknometer with water alone weighs 14.34N. Determine the specific gravity of the soil. **(04 Marks)**

OR

2 a. Define Liquid limit, plastic limit and shrinkage limit. **(06 Marks)**

b. Explain Indian standard soil classification system. **(06 Marks)**

c. Determine the dry density and void ratio. Given $V_b = 26kN/m^3$, W = 16%, G = 2.67. **(04 Marks)**

Module-2

3 a. Explain with sketches, the common clay minerals. **(08 Marks)**

b. A cohesive soil yields a maximum dry density of $18kN/m^3$ at on OMC of 16% during a standard proctor test. If G = 2.65, What is the degree of saturation? **(08 Marks)**

OR

4 a. Distinguish between standard proctor and modified proctor tests. **(04 Marks)**

b. Explain the laboratory procedure for conducting test on soil to determine its maximum dry density and optimum moisture content. **(06 Marks)**

c. What are the effects of compaction? **(06 Marks)**

Module-3

5 a. What is a flow net? What are the uses and characteristics of flow nets? **(08 Marks)**

b. Compute the quantity of water seeping under a weir per day for which the flow net has been constructed. The coefficient of permeability is 2×10^{-2}mm/s, $n_f = 5$ and $n_d = 18$. The difference in water level between O/S and D/S is 3.0m. The length of weir is 60m. **(08 Marks)**

OR

6 a. What are the factors affecting permeability? Explain them briefly. **(06 Marks)**

b. A soil sample 90mm high and 6000mm is in cross-section was subjected to a falling-head permeability test. The head fell from 500mm to 300mm in 1500s. The permeability of the soil was 2.4×10^{-3} mm/s. Determine the diameter of its stand pipe. **(10 Marks)**

Module-4

7 a. Explain Mass-Spring Analogy. **(08 Marks)**

b. Explain over consolidated soil, normally consolidated soil and under consolidated soil. **(08 Marks)**

OR

8 a. Explain square root of time fitting method. **(06 Marks)**

b. A 20m thick isotropic clay stratum over lies an imperrious rock. The coefficient of consolidation of soil is 5×10^{-8} mm^2/s. Find the time required for 50% and 90% consolidation. Time factors are 0.2 and 0.85 for u = 50% and u = 90% respectively. **(10 Marks)**

Module-5

9 a. Explain Mohr–Coulomb failure theory of soil. **(04 Marks)**

b. What are the factors affecting the shear strength of soil. **(04 Marks)**

c. A direct shear test was conducted on a soil and the following results were obtained.

Normal stress	kN/m^2	55	105	145
Shear stress	kN/m^2	30	36	41

Determine graphically, the cohesive strength and the angle of shearing resistance. **(08 Marks)**

OR

10 a. Explain the list procedure involved in conducting the direct shear list on soil. **(06 Marks)**

b. Define thixotrophy and sensitivity. **(04 Marks)**

c. When an unconfined compression test is conducted on a cylinder of soil, it fails under an axial stress of $120kN/m^2$. The failure plane makes an angle of 50° with the horizontal. Determine the cohesion and the angle of internal friction of soil. **(06 Marks)**

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CBCS SCHEME

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18CV32

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Strength of Materials

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain longitudinal strain and lateral strain. **(04 Marks)**

b. State and illustrate Saint Venant's principle. **(06 Marks)**

c. A tension test was conducted on mild steel bar and the following data was obtained from the test:
Diameter of the bar = 18mm
Gauge length of the bar = 82mm
Load at proportional limit = 75KN
Extension at a load of 62KN = 0.113mm
Load at failure = 82KN
Final gauge length of the bar = 106mm
Diameter of the bar at failure = 14mm
Determine the Young's modulus, proportional limit, true breaking stress, %elongation and percentage reduction in cross sectional area. **(10 Marks)**

OR

2 a. What are the elastic constants and explain them briefly. **(06 Marks)**

b. Obtain expression for temperature stress in a bar of uniform cross section when expansion or contraction is prevented partially. **(04 Marks)**

c. A weight of 390KN is supported by a short column of 250mm square in section. The column is reinforced with 8 steel bars of cross sectional area 2500mm^2. Find the stresses in steel and concrete if $E_s=15E_c$.
If stress in concrete must not exceed 4.5MN/m^2, what area of steel is required in order that column may support a load of 480KN. **(10 Marks)**

Module-2

3 a. Derive Lame's equation for the radial and hoop stress for thick cylinder subjected to internal and external fluid pressure. **(08 Marks)**

b. A 2-dimensional element has the tensile stresses of 600MN/m^2 and compressive stress of 400MN/m^2 acting on two mutually perpendicular planes and two equal shear stresses of 200MN/m^2 on their planes. Determine
i) Resultant stress on a plane inclined at 30° wrt x-axis.
ii) The magnitude and direction of principal stresses.
iii) Magnitude and direction of maximum shear stress. **(12 Marks)**

OR

4 a. Obtain expression for volumetric strain in thin cylinder subjected to internal pressure in the form of $e_v=\frac{pd}{2tE}\left[\frac{5}{2}-\frac{2}{m}\right]$. **(08 Marks)**

b. A cast iron pipe has 200mm internal diameter and 50mm metal thickness and carries water under a pressure of 5N/mm^2. Calculate the maximum and minimum intensities of circumferential stresses and sketch the distribution of circumferential stress intensity and the intensity of radial pressure across the section. **(12 Marks)**

Module-3

5 a. Define shear force, bending moment and point of contraflexure. Explain how to calculate them? **(06 Marks)**

b. Develop shear force diagram and bending moment diagrams for the beam loaded shown in Fig. Q5(b) marking the values at salient points. Determine the position and magnitude of maximum bending moment.

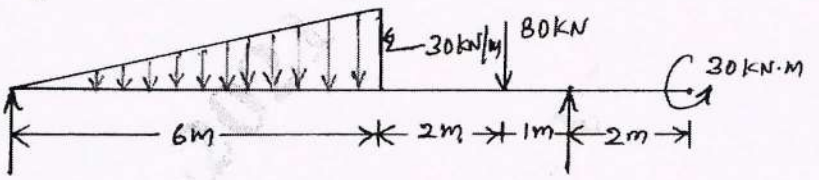

Fig. Q5(b) **(14 Marks)**

OR

6 a. Obtain the relationship between udl, shear force and bending moment. **(06 Marks)**

b. Construct SFD and BMD for the beam loaded shown in Fig. Q6(b). Also locate the point of contraflexure.

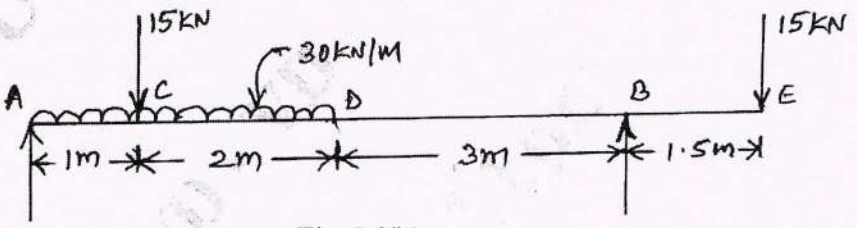

Fig.Q6(b) **(14 Marks)**

Module-4

7 a. Derive torsional equation with usual notations. **(06 Marks)**

b. A T-section of flange 120mm×12mm and overall depth 200mm with 12mm web thickness is loaded such that at a section it has a bending moment of 20KN.m and shear force of 120KN. Sketch the bending and shear stress distribution diagram marking the salient values. **(14 Marks)**

OR

8 a. Derive Bernoulli-Euler bending equation with usual notations. **(08 Marks)**

b. A solid circular shaft has to transmit power of 1000KW at 120rpm. Find the diameter of the shaft if the shear stress of the material is not to exceed 80N/mm^2. The maximum torque is 1.25 times the mean torque. What percentage saving in material could be obtained if the shaft is replaced by a hollow one whose internal diameter is 0.6 times the external diameter? The length of the shaft, material and maximum shear stress being same. **(12 Marks)**

Module-5

9 a. Define slope, deflection and elastic curve. Explain Macaulay's method of determining slope and deflection. **(10 Marks)**

b. Compare the crippling loads given by Euler's and Rankine's formula for a tubular steel column 2.5m long having outer and inner diameter as 40mm and 30mm respectively. The column is loaded through pin joints at the ends. Take permissible compressive stress as 320N/mm^2, Rankine constant as $\frac{1}{7500}$ and E=210GPa. For what length of the column of their cross section, does the Euler's formula cease to apply? **(10 Marks)**

OR

10 a. Differentiate between short and long column and what are the limitations of Eulcr's theory. **(06 Marks)**

b. Calculate slope at A and deflection at D for the overhanging beam shown in Fig. Q10(b). Take E = 200GPa and I = $50\times10^6 mm^4$. **(14 Marks)**

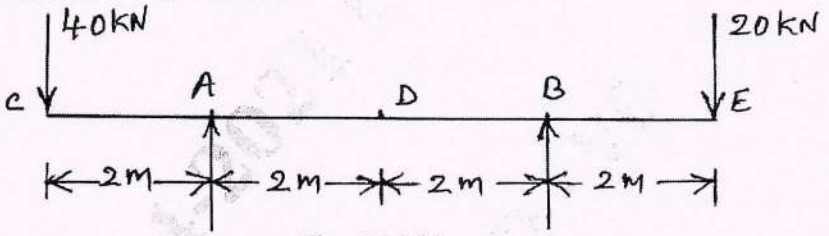

Fig. Q10(b).

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CBCS SCHEME

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18CV33

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Fluid Mechanics

Time: 3 hrs. Max. Marks: 100

Note: **1.** ***Answer any FIVE full questions, choosing ONE full question from each module.***
2. ***Assume missing data (if any) suitably.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Define the following and mention their units:
(i) Capillarity (ii) Surface tension (iii) Viscosity **(06 Marks)**

b. Derive an expression for capillary rise/fall of fluid in a tube of small diameter with sketches. **(06 Marks)**

c. A 100 mm diameter cylinder rotates concentrically inside a 105 mm diameter fixed cylinder. The length of both the cylinders is 250 mm. find the viscosity of the liquid that fills the space between the cylinders, if a torque of 1.0 N-m is required to maintain a rotating speed of 120 rpm. **(08 Marks)**

OR

2 a. State and prove Pascal's law for the intensity of pressure at a point in a static fluid. **(06 Marks)**

b. Derive an expression for difference in pressure between two points using a U-tube differential manometer. **(08 Marks)**

c. Determine the pressure intensity at the bottom of a tank filed with an oil of specific gravity 0.7 to a height of 10 m. **(06 Marks)**

Module-2

3 a. Define: (i) Total pressure (ii) Center of pressure **(04 Marks)**

b. Derive an expression for total pressure and center of pressure for an inclined plane surface submerged in a liquid. **(08 Marks)**

c. A 1200 mm × 1800 mm size rectangular plate is immersed in water with an inclination of 30° to the horizontal. The 1200 mm side of the plate is kept horizontal at a depth of 30 m below the water surface. Compute the total pressure on the surface and the position of center of pressure. **(08 Marks)**

OR

4 a. Differentiate between:
(i) Uniform and non-uniform flow
(ii) Steady and unsteady flow **(04 Marks)**

b. Derive continuity equation for a three dimensional flow in Cartesian coordinates. **(08 Marks)**

c. Evaluate stream function ψ and compute velocity of flow, V, for a two-dimensional flow field given by, $u = 4x^3$ and $v = -12x^2y$ at point (1, 2). Assume $\psi = 0$ at point (0, 0). **(08 Marks)**

Module-3

5 a. State Impulse Momentum principle. Give fields where it is applied. **(04 Marks)**

b. Derive an expression for force exerted by a fluid on a pipe bend. **(08 Marks)**

c. A pipe of 300 mm diameter, carrying 15000 litres per minute of water is bent by 135°. Find the magnitude and direction of resultant force exerted by the flowing fluid on the bend if the pressure of the flowing water is 39.24 N/cm^2. **(08 Marks)**

OR

6 a. What is venture effect? Derive an expression for discharge through a venturimeter. **(08 Marks)**

b. A pitot tube fixed in a pipe of 300 mm diameter is used to measure the velocity and rate of flow. If the stagnation and static pressure heads are 6.0 m and 5.0 m respectively, compute the velocity and rate of flow. Assume $C_V = 0.98$ for the pitot tube. **(06 Marks)**

c. A 20 cm × 10 cm venturimeter is used to measure the flow of water in a horizontal pipe. The pressure at the inlet of venturimeter is 17.658 N/cm^2 and the vacuum pressure at the throat is 30 cm of mercury. Find the discharge of water through the venturimeter assuming $C_d = 0.98$. **(06 Marks)**

Module-4

7 a. Define hydraulic coefficients for an orifice and give the relation between them. **(06 Marks)**

b. Give classification of mouth pieces with suitable sketches. **(06 Marks)**

c. A jet of water issuing from an orifice 25 mm diameter under a constant head of 1.50 m, falls 0.915 m vertically before it strikes the ground at a horizontal distance of 2.288 m from vena-contracta. The discharge is found to be 102 litres per minute. Calculate the hydraulic coefficients of the orifice. **(08 Marks)**

OR

8 a. Enumerate advantages of triangular notches over rectangular notches. **(04 Marks)**

b. Derive the expression for discharge through a triangular notch. **(08 Marks)**

c. A river 60 m wide has vertical banks and 1.50 m depth of flow. The velocity of flow is 1.20 m/s. A broad crested weir 2.40 m high is constructed across the river. Find the head on the weir crest considering the velocity of approach. Assume $C_d = 0.90$. **(08 Marks)**

Module-5

9 a. Derive Darcy-Weisbach equation for head loss due to friction in a pipe. **(08 Marks)**

b. List major and minor losses in a pipe flow. **(04 Marks)**

c. Water is required to be supplied to a colony of 4000 residents at a rate of 180 lires per person from a source 3 km away. If half the daily requirement needs to be pumped in 8 hours against a friction head of 18 m, find the size of the main pipe supplying water. Assume friction factor as 0.028. **(08 Marks)**

OR

10 a. What is an equivalent pipe? Derive an expression for diameter of an equivalent pipe. **(08 Marks)**

b. Explain phenomenon of water hammer in pipes. **(04 Marks)**

c. Water is flowing in a pipe of 150 mm diameter with a velocity of 2.5 m/s, when it is suddenly brought to rest by closing the valve. Find the pressure rise in the pipe assuming it to be elastic with E = 206 GN/m^2 and Poisson's ration = 0.25. The bulk modulus of water, K = 206 GN/m^2. Thickness of pipe wall is 5 mm. **(08 Marks)**

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CBCS SCHEME

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18CV34

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Building Materials and Construction

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. What are the factors that cause deterioration of stones and explain the methods commonly adopted to preserve the stones. **(08 Marks)**

b. Briefly explain the various field and laboratory tests conducted on bricks to find its suitability for construction. **(08 Marks)**

c. What are the advantages of cement concrete blocks? **(04 Marks)**

OR

2 a. Lists the tests conducted on fine aggregates and explain any one of them in detail. **(08 Marks)**

b. Explain impact and abrasion tests conducted on coarse aggregates. **(08 Marks)**

c. What are the characteristics of good timber used for construction? **(04 Marks)**

Module-2

3 a. What are the functions of a foundation? Mention the situations during which pile foundations are adopted. **(08 Marks)**

b. Write a note on:
i) Spread footing ii) Strap footing **(08 Marks)**

c. Write the advantages of cavity walls. **(04 Marks)**

OR

4 a. Sketch the elevation of a brick wall built in i) English bond ii) Flemish bond. Compare the merits and demerits of English bond and Flemish bond. **(08 Marks)**

b. Write a note on classification of stone masonry. **(08 Marks)**

c. Write a note on partitions walls. **(04 Marks)**

Module-3

5 a. Draw a neat sketch of an arch and explain the technical terms used. **(08 Marks)**

b. Explain i) Chejja ii) Canopy iii) Balcony iv) Lintel. **(08 Marks)**

c. Write a note on stability of arch. **(04 Marks)**

OR

6 a. List the types of flooring and explain the method of laying of cement concrete flooring in detail. **(08 Marks)**

b. List the classification of pitched roof. With neat sketches explain any two of them. **(08 Marks)**

c. What are the factors to be considered while selecting a roof covering? **(04 Marks)**

Module-4

7 a. With the help of a neat sketch explain
i) Paneled door ii) Collapsible door. **(08 Marks)**

b. Write a note on
i) Bay window ii) Steel window **(08 Marks)**

c. What are the guidelines to be followed while locating doors and windows? **(04 Marks)**

OR

8 a. Write a note on
i) Shoring ii) Underpinning. **(08 Marks)**

b. Plan a dogged stair for a building in which vertical distance between the floors is 3.6m. The stair hall measures 2.8m×5.0m (internal dimension). **(08 Marks)**

c. With the help of a neat sketch explain
i) Tread and Riser ii) Flight and Landing. **(04 Marks)**

Module-5

9 a. What are the objectives of plastering? Explain the defects in plastering. **(10 Marks)**

b. Briefly explain the methods of damp proofing. **(10 Marks)**

OR

10 a. Explain the method of laying stucco plastering and lathe plastering. **(10 Marks)**

b. Explain the constituents of a paint and explain the procedure of painting on new wood works. **(10 Marks)**

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CBCS SCHEME

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18CV35

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Basic Surveying

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Define surveying. Discuss the classification of surveying. **(10 Marks)**

b. What is ranging? Explain the indirect method for ranging with neat sketch. **(08 Marks)**

c. What is well conditioned triangle? **(02 Marks)**

OR

2 a. Write short notes on optical square and prism square. **(06 Marks)**

b. A big pond obstructs the chain line such that P and T are on the opposite sides of a pond and line PQ and PR were selected on the left hand side and Right hand side respectively. So that point Q, T and R were in straight line. Find length PT. Take PQ 150m, PR = 230m, QT = 75m, RT = 100m. **(08 Marks)**

c. Explain briefly chains on slopping ground by stepping method. **(06 Marks)**

Module-2

3 a. Differentiate between :
i) True meridian and magnetic meridian ii) Dip and declination iii) Agonic and isogonic lines. **(06 Marks)**

b. The following bearings were observed with compass. Calculate the interior angles and draw rough diagram.

Line	AB	BC	CD	DE	EA
Bearing	60°30′	122°0′	46°0′	205°30′	300°

(08 Marks)

c. What is local attraction? How it is detected and eliminated? Also give the reason for it. **(06 Marks)**

OR

4 a. What is traversing? What are the different types of traversing? **(04 Marks)**

b. What is closing error? Explain the Bowditch rule of graphical adjustment with sketch. **(08 Marks)**

c. Following are the observed length and bearings of the lines of a closed traverse ABCDEA. The length and bearing of line EA emitted, calculate it.

Line	Length (m)	Bearings
AB	204	87°30′
BC	226	20°20′
CD	187	280°0′
DE	192	210°30′
EA	?	?

(08 Marks)

Module-3

5 a. Explain the following terms. i) Elevation ii) Benchmark iii) Datum iv) Mean sea level. **(04 Marks)**

b. What do you understand by balancing of sight? With figure explain how the errors are eliminated. **(06 Marks)**

c. The following is the page of a level book. Find out the missing reading(X) and complete the level book. Apply usual arithmetical check.

Sl.No.	BS	IS	FS	HI	RL	Remark
1	4.000			X	X	
2		X			195.935	
3	2.150		3.995	X	X	
4		2.415			195.240	BM
5		1.665			X	
6		X			200.770	
7	3.610		X	X	X	
8			1.715		196.985	

(10 Marks)

OR

6 a. Write short notes on : i) Curvature and Refraction error ii) Borometric leveling and fly leveling iii) Collimation error and hypsometry. **(06 Marks)**

b. Describe the procedure for reciprocal leveling with neat sketch. **(06 Marks)**

c. The following observations were taken in reciprocal leveling. Determine the R.L of B if that of A is 100.150m. Also calculate the collimation error if AB = 1000m.

Inst. Station	Staff reading	
	A	B
A	1.625	2.545
B	0.725	1.405

(08 Marks)

Module-4

7 a. Describe briefly radiation method and intersection method of plane tabling. **(10 Marks)**

b. Define two point problem. Explain the graphical method of solution of two point problem with figure. **(10 Marks)**

OR

8 a. Write short notes on :i) Orientation of plane table ii) Triangle of error iii) Alidade. **(06 Marks)**

b. Discuss the temporary adjustments of plane table. **(06 Marks)**

c. What are the advantages and disadvantages of plane table? **(08 Marks)**

Module-5

9 a. What is contour? What are the uses of contour lines? **(08 Marks)**

b. A road embankment is 11m wide at the formation level and has side slope 1 : 2(V : H). The ground level at every 80m along centre line are shown in table. The formation level at zero chainage is 123.0 and embankment having a rising gradient 1 : 100 calculate the volume of earthwork by trapezoidal and primordial rule.

Dist.	0	80	160	240	320
RL	120.8	122.5	123.4	123.8	124.5

(12 Marks)

OR

10 a. Define the following terms : i) Contour interval ii) Interpolation of contour iii) Horizontal equivalent v) Contour gradient. **(04 Marks)**

b. What is planimeter? Explain the polar planimeter along with essential parts. **(12 Marks)**

c. Determine the area of plan from following data. Needle point out side plan. Zero of dial passed index mark once in clockwise direction : Initial reading = 8.364
Final reading = 4.234. **(04 Marks)**

CBCS SCHEME

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18CV36

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Engineering Geology

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Discuss in brief different branches of Geology, which are related to Civil Engineering. **(04 Marks)**

b. Briefly explain the internal structure of the earth based on different unconformities and add a note on its composition. **(08 Marks)**

c. Explain the role of Geology in the field of Civil Engineering. **(08 Marks)**

OR

2 a. What is Mineral? Describe the following Physical properties of a Mineral.
i) FORM ii) Hardness iii) Fracture. **(06 Marks)**

b. Explain the primary structures in Sedimentary rocks, with neat sketches. **(08 Marks)**

c. Write a note on Soil profile. **(06 Marks)**

Module-2

3 a. What are Folds? How are they caused? Discuss the various types of folds in rock and influences on Civil Engineering. **(15 Marks)**

b. What is Normal Fault? Add a note on Horst and Graben, with neat sketches. **(05 Marks)**

OR

4 a. What is Weathering? Describe Physical and Mechanical weathering. **(10 Marks)**

b. Explain Railway ballast with examples. **(05 Marks)**

c. Write notes on causes of Landslides. **(05 Marks)**

Module-3

5 a. What is an Out Crop? Describe the terms strike and DIP, with a neat sketch. **(08 Marks)**

b. Explain Floods, causes and its control. **(06 Marks)**

c. Write a note on Tunneling through the fold axis of an Antidine. **(06 Marks)**

OR

6 a. Briefly explain Exogeneous and Endogeneous geological events. **(06 Marks)**

b. Describe the different drainage patterns of a River basin, with neat sketches. **(08 Marks)**

c. Briefly explain Extrusive and Intrusive forms of Igneous rocks. **(06 Marks)**

Module-4

7 a. Explain the Electrical resistivity method for exploration of ground water. **(08 Marks)**

b. Explain how the quality of ground water can be determined by SAR , RSC , GTH. **(04 Marks)**

c. Explain how Artificial recharge of ground water can be made. **(08 Marks)**

OR

8 a. Describe with a neat diagram, Vertical distribution of Ground water. **(10 Marks)**

b. Write a brief note on Land forms. **(10 Marks)**

Module-5

9 a. What is an Earth Quake? Describe the Tectonic causes of Earthquake and its effects. **(08 Marks)**

b. Explain Aquifer and its types. **(06 Marks)**

c. Write a note on Specific Yield and Specific Retention. **(06 Marks)**

OR

10 a. What is Remote Sensing? Write its application in Civil Engineering. **(08 Marks)**

b. What is GIS? Name the different components of GIS. **(06 Marks)**

c. Write an application on Global Positioning System (GPS) in Civil Engineering. **(06 Marks)**

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CBCS SCHEME

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17CV/CT32

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Strength of Materials

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define: (i) Young's modulus (ii) Bulk modulus (iii) Poisson's ratio. Derive a relationship between them. **(10 Marks)**

b. Two solid cylindrical rods are connected and loaded as shown in Fig.Q1(b). Determine: (i) Total deformation (ii) Deformation at point B. $E_S = 200$ GPa, $E_b = 100$ GPa.

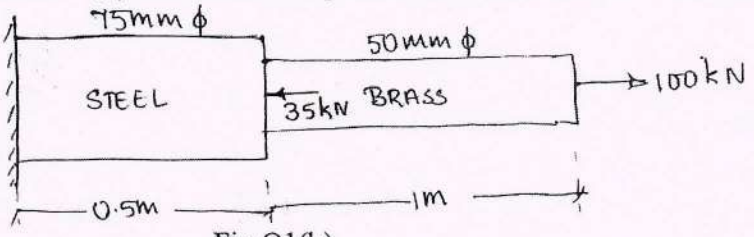

Fig.Q1(b) **(10 Marks)**

OR

2 a. A compound bar made of steel plate 60 mm wide and 10 mm thick to which a copper plate 60 mm wide and 5 mm thick are rigidly connected to each other. The length of the bar is 0.7 m. If the temperature is raised by 80°C. Determine the stress in each metal and the change in length.

$E_S = 200$ GPa, $\alpha_S = 12 \times 10^{-6}$/°C ; $E_{cu} = 100$ GPa, $\alpha_{cu} = 17 \times 10^{-6}$/°C **(12 Marks)**

b. Derive an expression for extension of the bar due to its self weight only having area 'A' and length L suspended from its top. **(04 Marks)**

c. Write a note on thermal stresses. **(04 Marks)**

Module-2

3 a. At a certain point in a strained material the stress condition shown in Fig.Q3(a) exists. Find:
(i) The normal and shear stress on the inclined plane AB
(ii) Principal stresses and principal planes
(iii) Maximum shear stresses and their planes

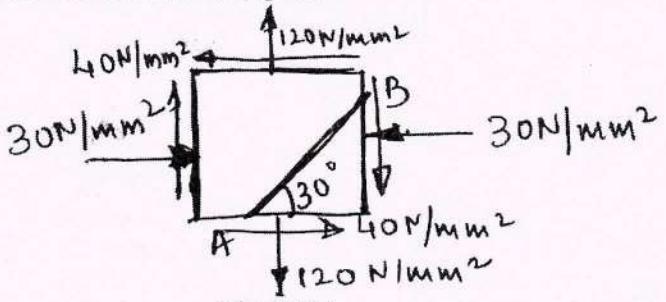

Fig.Q3(a) **(12 Marks)**

b. Derive an expressions for volumetric strain in case of a thin cylindrical shell of diameter 'd' subjected to internal pressure 'p'. **(05 Marks)**

c. Define: (i) Principal stresses (ii) Principal planes **(03 Marks)**

OR

4 a. A cylindrical shell is 3m long 1m internal diameter and is subjected to an internal pressure of 1 N/mm^2. If thickness of the shell is 12mm, find the circumferential stress and longitudinal stress. Also find maximum shear stress and the changes in the dimensions of the shell. Take E = 200 kN/mm^2 and $\mu = 0.3$. **(10 Marks)**

b. A thick metallic cylindrical shell of 150 mm, internal diameter is required to withstand an internal pressure of 8 MPa. Find the necessary thickness of cylinder, if permissible stress of the section is 20 MPa. **(10 Marks)**

Module-3

5 a. Derive relation between shear force, bending moment and load. **(06 Marks)**

b. Calculate SF and BM at salient points and draw SFD and BMD for the beam shown in Fig.Q5(b).

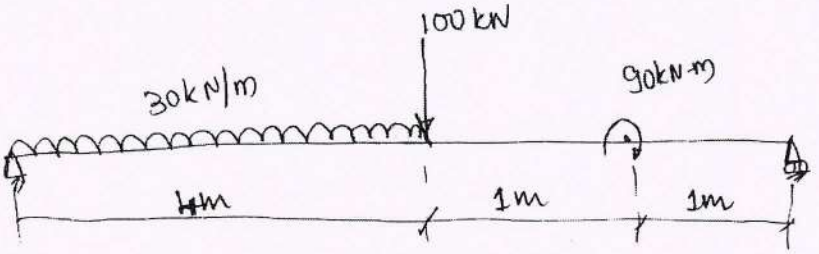

Fig.Q5(b) **(14 Marks)**

OR

6 a. Define: (i) Bending moment (ii) Shear force **(04 Marks)**

b. Draw SFD and BMD for beam shown in Fig.Q6(b).

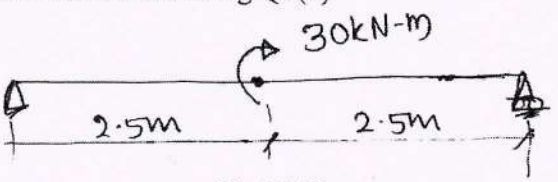

Fig.Q6(b) **(06 Marks)**

c. Draw SFD and BMD for simply supported beam of length L with point load 'P' placed at a distance 'a' from right support and 'b' from left support. **(10 Marks)**

Module-4

7 a. Define: (i) Torsional strength (ii) Torsional stiffness (iii) Torsional rigidity **(06 Marks)**

b. A shaft transmits 300 KW power at 120 rpm. Determine:

(i) The necessary diameter of solid circular shaft.

(ii) The necessary outer diameter of hollow circular section such that the inner diameter being 2/3 of the outer diameter. Take allowable shear stress as 70 N/mm^2. **(14 Marks)**

OR

8 Write short notes on any four:

a. Maximum principal stress theory

b. Maximum shear stress theory

c. Maximum principal strain theory

d. Maximum strain energy theory

e. Maximum shear strain energy theory **(20 Marks)**

Module-5

9 a. Show that for a rectangular cross section maximum shear stress is 1.5 times average shear stress. **(06 Marks)**

b. A simply supported beam of span 6 m has a cross section as shown in Fig.Q9(b). It carries 2 point loads each of 30 kN at a distance of 2m from each support. Calculate the bending stress and shear stress for maximum values of bending moment and shear force respectively. Draw neat diagram of bending stress and shear stress distribution across the cross section.

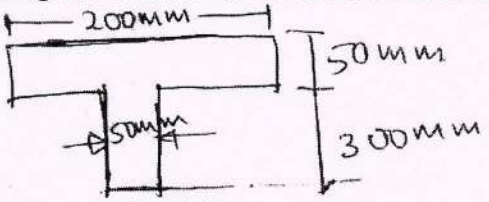

Fig.Q9(b) **(14 Marks)**

OR

10 a. Derive an expression for Euler's buckling load for long column with one end fixed and other end free. **(08 Marks)**

b. The cross section of a column is a hollow rectangular section with its external dimensions 200 mm × 150 mm. The internal dimension are 150 × 100 mm. The column is 5m long and fixed at both ends. If E = 120 GPa, calculate the critical load using Euler's formula. Compare the above load with the value obtained from Rankine's formula. The permissible compressive stress is 500 N/mm^2. The Rankine's constant is 1/6000. **(12 Marks)**

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CBCS SCHEME

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17CV33

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Fluid Mechanics

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define the following fluid properties. Also mention their units.
i) Specific Gravity ii) Viscosity iii) Mass Density iv) Specific Volume. **(06 Marks)**

b. Define capillarity and derive expressions for capillary rise and capillary fall. **(06 Marks)**

c. A differential manometer is connected at the two points A and B of two pipes as shown in Fig.Q.1(c). The pipe A contains a liquid of specific gravity of 1.5, while pipe B contains a liquid of specific gravity of 0.9. The pressures at A and B are 1kgf/cm^2 and 1.8kgf/cm^2 respectively. Find the difference is mercury level in the differential manometer. **(08 Marks)**

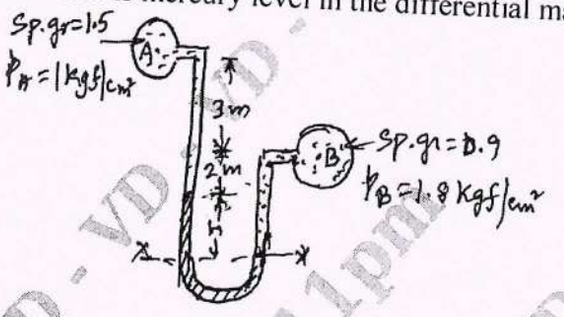

Fig.Q.1(c)

OR

2 a. With neat sketch, explain Bourdon tube pressure gauge. **(06 Marks)**

b. State and prove hydrostatic law of pressure. **(06 Marks)**

c. The dynamic viscosity of an oil used for lubrication between a shaft and sleeve is 0.6N.sec/m^2. The shaft is of diameter 0.4m and rotates at 190rpm. Calculate the power lost in the bearing for a sleeve length of 90mm. The thickness of the oil film is 1.5mm. **(08 Marks)**

Module-2

3 a. Define total pressure and centre of pressure. Also derive expressions for total pressure and centre of pressure for a plane surface submerged vertically in a liquid. **(08 Marks)**

b. Distinguish between:
i) Laminar Flow and turbulent flow
ii) Uniform flow and non uniform flow
iii) Steady flow and unsteady flow. **(06 Marks)**

c. Determine the total pressure and centre of pressure on an isosceles triangular plate of base 4m and altitude 4m when it is immersed vertically in an oil of specific gravity 0.9. The base of the plate coincides with the free surface of oil. **(06 Marks)**

OR

4 a. Derive the three dimensional continuity equation in the Cartesian coordinates. **(06 Marks)**

b. The velocity vector n a fluid flow is given as $V = 4x^3i - 10x^2yj + 2tk$. Find the velocity and acceleration of a fluid particle at (2, 1, 3) at time t =1. **(08 Marks)**

c. Determine the total pressure on a circular plate of diameter 1.5m which is placed vertically in water in such a way that the centre of the plate is 3m below the free surface of water. Find the position of centre of pressure also. **(06 Marks)**

Module-3

5 a. Define free vortex flow and forced vortex flow. Also mention two examples for each. **(04 Marks)**

b. Derive Euler's equation of motion along a stream line and obtain Bernoulli's equation from Euler's equation. Also mention the assumptions made in derivation. **(10 Marks)**

c. A 30cm × 15cm venturimeter is inserted on a vertical pipe carrying water, flowing in upward direction. A differential mercury manometer connected to the inlet and throat gives a reading of 20cm. Find the discharge. Take $C_d = 0.98$. **(06 Marks)**

OR

6 a. Derive an expression for discharge through a venturimeter. **(06 Marks)**

b. List the various instruments that works on the Bernoullie's principle. Also explain how pilot tube is used to measure velocity of flow. **(06 Marks)**

c. A 300mm diameter pipe carries water under a head of 20m with a velocity of 3.5m/s. If the axis of the pipe turns through 45°, find the magnitude and direction of the resultant force on the bend. **(08 Marks)**

Module-4

7 a. Give a detailed note on classification of orifices mouth pieces. **(06 Marks)**

b. Derive an expression for discharge through a Borda's mouth piece running free. **(06 Marks)**

c. Water flows over a rectangular weir 1m wide at a depth of 150mm and afterwards passes through a triangular right angled weir. Taking C_d for the rectangular weir and triangular weir as 0.62 and 0.59 respectively. Find the depth over triangular weir. **(08 Marks)**

OR

8 a. Give a detailed note on classification of weirs. Derive an expression for discharge through a triangular notch. **(10 Marks)**

b. Define hydraulic coefficients. Also mention the general values of hydraulic coefficients. **(06 Marks)**

c. A jet of water, issuing from a sharp edged vertical orifice under a constant head of 10cm at a certain point, has the horizontal and vertical coordinates measured from the vena-contracta as 20cm and 10.5cm respectively. Find the value of C_v and also value of C_c if $C_d = 0.6$. **(04 Marks)**

Module-5

9 a. Give a brief note on loss of energy in pipes. Also derive Darcy's Weisbach equation for loss of energy due to friction. **(10 Marks)**

b. Give a brief note on water harmer in pipes. **(04 Marks)**

c. Three pipes of lengths 800m, 500m and 400m and diameters 500mm, 400mm and 300mm respectively are connected in series. These pipes are to be replaced by a single pipe of length 1700m. Find the diameter of the single pipe. **(06 Marks)**

OR

10 a. Derive an expression for the loss of head due to sudden enlargement of pipe section. **(08 Marks)**

b. The water is flowing with a velocity of 1.5m/s in a pipe of length 2500m and of diameter 500mm. At the end of the pipe, a valve is provided. Find the rise in pressure if the valve is closed in 25 seconds. Take the value of C = 1460m/s. **(06 Marks)**

c. An oil of specific gravity 0.7 is flowing through a pipe of diameter 300mm at the rate of 500l/s. Find the head lost due to friction and power required to maintain the flow for a length of 1000m. Take $\gamma = 0.29$ stokes. **(06 Marks)**

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CBCS SCHEME

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17CV34

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Basic Surveying

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain classification of Surveying in detail. **(10 Marks)**

b. Explain principles of Surveying in detail. **(06 Marks)**

c. Distinguish between Plane and Geodetic survey. **(04 Marks)**

OR

2 a. Discuss accessories required for horizontal measurements in detail. **(10 Marks)**

b. To measure a base line, a steel tape 30m long standardized at 15°C with a pull of 100N was used. Find the correction per tape length if the temperature at the time of measurement was 20°C and the pull exerted was 160 N. If the length of 250m is measured on a slope of 1 in 4, find the horizontal length. Take $E = 2.1\times10^5$ N/mm^2 ; $\alpha = 11.2\times10^{-6}$/°C and cross-sectional area of tape = 0.08 cm^2. **(10 Marks)**

Module-2

3 a. Define Local attraction? How it defected? Explain. **(06 Marks)**

b. Distinguish between Prismatic compass and Surveyor's compass. **(04 Marks)**

c. Determine the bearings of sides of regular pentagon of sides 5m, if the bearing of the first line AB is 80°. **(10 Marks)**

OR

4 a. Explain the temporary adjustment of transit theodolite in detail. **(10 Marks)**

b. Discus the methods of Repetition and reiteration for measuring horizontal angle in detail with neat sketch. **(10 Marks)**

Module-3

5 a. What is meant by balancing of Traverse? Explain the Bowditch method of adjusting the traverse. **(10 Marks)**

b. In a closed traverse ABCDE, the length and bearings of EA has been omitted. Compute the length and bearing of the line EA.

Line	Length (m)	Bearing
AB	204	87° 30′
BC	226	20° 20′
CD	187	280° 0′
DE	192	210° 3′
EA	?	?

(10 Marks)

OR

6 a. Derive the distance and elevation formulae for stadia tachometry, when the staff is held vertical and the line of sight being inclined upwards and downwards with neat sketch. **(10 Marks)**

b. A tacheometer, fitted with an anallactic lens and having the multiplying constant 100, was setup at station C to determine the gradient between two points A and B and the following observations were taken, keeping the staff vertical.

Staff at	Vertical angle	Stadia readings
A	+4° 20′ 0″	1.300, 1.610, 1.920
B	+0° 10′ 40″	1.100, 1.410, 1.720

(10 Marks)

Module-4

7 a. The following readings were observed successively with a levelling instrument. The instrument was shifted after 5th and 11th readings.
0.585, 1.010, 1.735, 3.295, 3.775, 0.350, 1.300, 1.795, 2.575, 3.375, 3.895, 1.735, 0.635 and 1.605m.
Draw up a page of level book and determine the RL of various points if RL of first point is 136.440m. Use Rise and Fall method. **(10 Marks)**

b. Enumerate the errors in leveling in detail. **(10 Marks)**

OR

8 a. Derive an equation to determine the difference in elevation of the instrument station and top of a Chimney using Double plane method. **(10 Marks)**

b. The following observations were made on a hill top to ascertain its elevation. The height of the target F was 5m. The instrument stations were 100m apart and were in line with F.

Instrument Station	Staff reading on BM	Vertical angle	Remarks
01	2.550	18° 6′	RL of BM
02	1.670	28° 42′	= 345.580 m

(10 Marks)

Module-5

9 a. A railway embankment of formation width 10m is to be built with side slope of 1 vertical to 2 horizontal. The ground is horizontal in the direction transverse to the centre line. Length of embankment is 150m. The centre height of embankment at 25m intervals are as given below:
1.8, 3.3, 3.6, 4.2, 2.9, 2.6, 2.2m
Calculate the volume of earth filling. **(10 Marks)**

b. Explain the method of computation of volume by the
(i) Trapezoidal rule (ii) Prismoidal rule **(10 Marks)**

OR

10 a. Explain characteristics of contours with neat sketches. **(10 Marks)**

b. Discuss the uses of contour maps for various Civil engineering works with sketches. **(10 Marks)**

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USN | | | | | | | | | | 17CV42

Fourth Semester B.E. Degree Examination, Jan./Feb.2021
Analysis of Determinate Structures

Time: 3 hrs. Max. Marks: 100

Note: 1. *Answer any FIVE full questions, choosing ONE full question from each module.*
2. *Assume any missing data, if any.*

Module-1

1 a. Explain different forms of structures with examples. **(04 Marks)**

b. Distinguish between determinate and indeterminate structures with examples. **(04 Marks)**

c. Find the forces in all the members of the truss shown in Fig. Q1 (c) and tabulate it. **(12 Marks)**

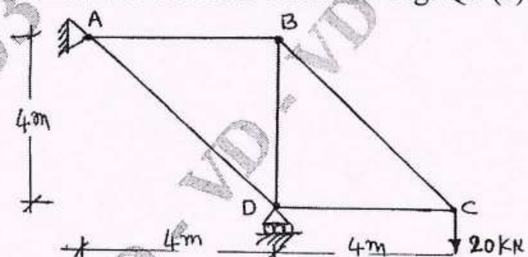

Fig. Q1 (c)

OR

2 a. List the assumptions made in the analysis of pin jointed plane truss. **(04 Marks)**

b. Determine the static and kinematic indeterminancy for the structures shown in Fig. Q2 (b). **(06 Marks)**

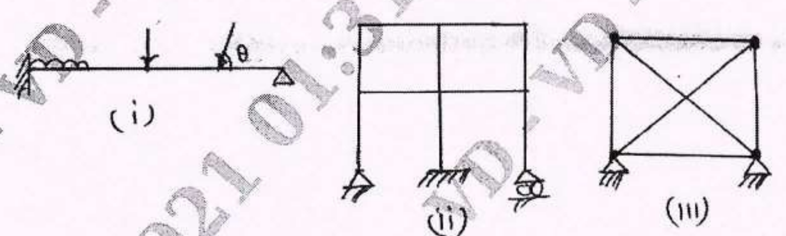

Fig. Q2 (b)

c. Find the forces in the members DE, DF and EF of the truss shown in Fig. Q2 (c) by method of sections. **(10 Marks)**

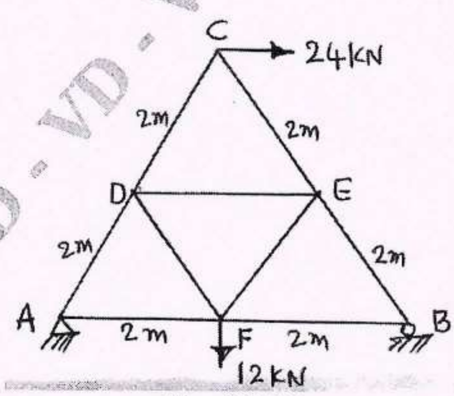

Fig. Q2 (c)

Module-2

3 a. Derive the differential equation of deflection curve for the beam. **(06 Marks)**

b. State conjugate beam theorems. **(04 Marks)**

c. Find deflection at 'C' and slope at A and B for the beam shown in Fig. Q3 (c) using moment area method. **(10 Marks)**

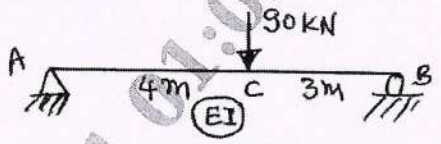

Fig. Q3 (c)

OR

4 a. State and prove moment area theorems. **(06 Marks)**

b. Find deflection at end of the Cantilever beam of span 'L' carrying udl of w/m runover entire span. Take EI constant using conjugate beam method. **(04 Marks)**

c. Find deflection at the load points C and D for the simply supported beam shown in Fig. Q4 (c) using Maculay's method. Take EI = 12000 kN-m^2 **(10 Marks)**

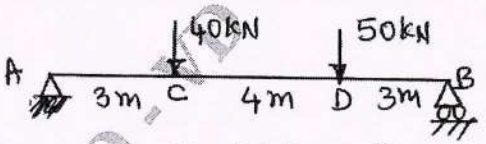

Fig. Q4 (c)

Module-3

5 a. State and prove in Castigliano's theorem – 1. **(06 Marks)**

b. State the principle of virtual forces. **(04 Marks)**

c. Determine the deflection at 'C' of the beam shown in Fig. Q5 (c) using strain energy method. **(10 Marks)**

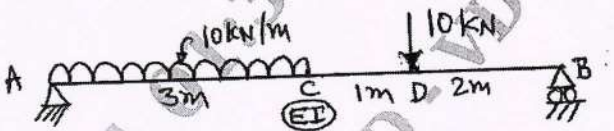

Fig. Q5 (c)

OR

6 a. Derive the expression for the strain energy stored in a beam due to flexure. **(06 Marks)**

b. Distinguish between strain energy and complimentary energy. **(04 Marks)**

c. Determine the horizontal deflection at 'C' of the truss loaded as shown in Fig. Q6 (c) using unit load method. All the members have same cross sectional area of 1500 mm^2 and E = 200 GPa. **(10 Marks)**

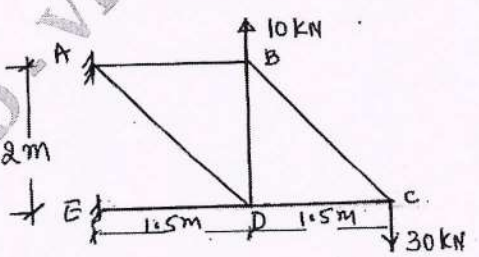

Fig. Q6 (c)

Module-4

7 a. A three hinged parabolic area has a span of 24 m and a central rise of 4 m. It carries concentrated loads of 75 kN at 18 m from the left support and udl of 45 kN/m over the left half of the portion. Determine the moment, normal thrust and radial shear at a distance 6 m from the left support. **(12 Marks)**

b. A cable used to support two loads of 40 kN and 40 kN across a span of 60 m. The cable length is 62 m. The loads acting at 20 m from left and right support. Find the tension in various segments of the cable shown in Fig. Q7 (b). **(08 Marks)**

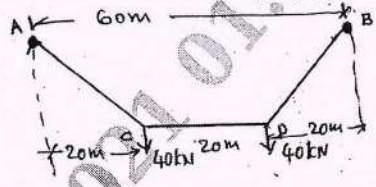

Fig. Q7 (b)

OR

8 a. A cable is suspended from two points A and B which are 80 m apart. A is 5 m below B. The lowest point on the cable is 10 m below A. The cable supports a udl of 20 kN/m over entire span. Calculate (i) reactions at supports (ii) Maximum tension in cable. **(08 Marks)**

b. A three hinged parabolic arch of span 50 m has its supports at depth 4m and 16 m below crown shown in Fig. Q8 (b). Determine reactions at the supports and bending moments under the loads. Also draw BMD. **(12 Marks)**

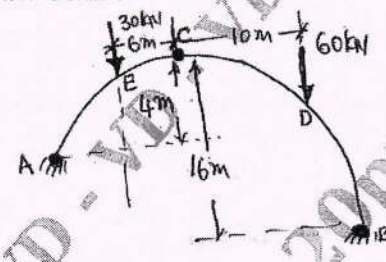

Fig. Q8 (b)

Module-5

9 a. Draw ILD for SF and BM at a section 3 m from left support for a S.S beam of span 12 m. Calculate maximum SF and BM at this section due to rolling load 5 m long and 2 kN/m intensity. **(08 Marks)**

b. A series of wheel loads crosses over a girder of span 15 m from left to right with 40 kN load leading as shown in Fig. Q9 (b). Determine maximum BM and SF at a section 4 m from left support. **(12 Marks)**

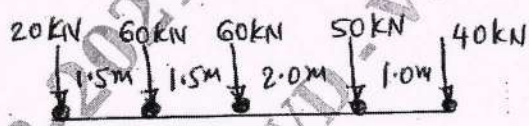

Fig. Q9 (b)

OR

10 a. Draw influence line diagram for shear force at any section from first principles. **(04 Marks)**

b. What is influence line and state the importance of influence lines? **(04 Marks)**

c. A train of five wheel loads crosses a simply supported beam of span 30 m as shown in Fig. Q10 (c). Calculate maximum positive and negative SF at midspan and absolute maximum BM anywhere in the span. **(12 Marks)**

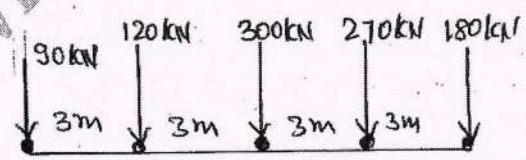

Fig. Q10 (c)

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CBCS SCHEME

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17CV43

Fourth Semester B.E. Degree Examination, Jan./Feb. 2021
Applied Hydraulics

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define dimensional homogeneity. Give two examples. **(04 Marks)**

b. Explain how repeating variables are selected for dimensional analysis in π-theorem. Also state π-theorem. **(06 Marks)**

c. The frictional torque T of a disc of diameter D rotating at a speed N in a fluid of viscosity μ and density ρ in a turbulent flow is given by

$$T = D^5 N^2 \rho \phi \left(\frac{\mu}{D^2 N \rho} \right).$$

Prove this by Buckingham's π - theorem. **(10 Marks)**

OR

2 a. Define (i) Metacentric height (ii) Buoyancy (iii) Prototype (iv) Similitude. **(08 Marks)**

b. What do you understand by Froude model law? Mention its applications. Derive any 5 scale ratios for physical quantities based on Froude model law. **(12 Marks)**

Module-2

3 a. Derive Chezy's equation for flow through an open channel. Bring out relation between N and C. **(10 Marks)**

b. A trapezoidal channel has to carry 142 m^3/minute of water is designed to have a minimum cross section. Find the bottom width and depth of the bed slope is 1 in 1200, the side slopes at 45° and Chezy's coefficient is 55. **(10 Marks)**

OR

4 a. What is specific energy? Define and draw specific energy curve and also derive expressions for critical depth and critical velocity. **(10 Marks)**

b. The discharge of water through a rectangular channel of width 6m is 18 m^3/sec when depth of flow of water is 2m. Calculate

(i) Specific energy of the flowing water
(ii) Critical depth and critical velocity
(iii) Value of minimum specific energy
(iv) State whether the flow is subcritical or supercritical. **(10 Marks)**

Module-3

5 a. Explain the term hydraulic jump with a neat sketch. Derive an expression for loss of energy due to hydraulic jump. **(10 Marks)**

b. A sluice gate discharges water into a horizontal rectangular channel with a velocity of 6 m/s and depth of flow is 0.4m. The width of the channel is 8m. Determine whether a hydraulic jump will occur and if so, find its height and loss of energy per kg of water. Also find power lost in the hydraulic jump. **(10 Marks)**

OR

6 a. With a neat sketch, explain what is back water curve and afflux. Derive an expression for length of backwater curve. **(10 Marks)**

b. Find the slope of the free water surface in a rectangular channel of width 15m having depth of flow 4m. Discharge through channel is 40 m^3/sec. Bed of channel is having a slope of 1 in 4000. Take Chezy's C = 50. **(10 Marks)**

Module-4

7 a. With a neat sketch explain the concept of velocity triangles. **(10 Marks)**

b. A jet of water having a velocity of 35 m/s impinges on a series of vanes moving with a velocity of 20 m/s. The jet makes an angle of 30° to direction of motion of vanes when entering and leaves at 12°.

(i) Draw velocity Δ^{les} at inlet and outlet

(ii) Find angles of vane tips so that water enters and leaves without shock.

(iii) Work done per unit wt. of water entering the vanes. **(10 Marks)**

OR

8 a. Draw a typical layout of a hydroelectric plant and explain various heads. **(10 Marks)**

b. A Pelton wheel is to be designed for following specifications:
Shaft power = 11,772 kW ; Head = 380 m ; Speed = 750 rpm ; Overall efficiency = 86% ; Jet diameter not to exceed $1/6^{th}$ of wheel ϕ. Determine (i) Wheel diameter (ii) No. of Jets. **(10 Marks)**

Module-5

9 a. Define Draft Tube. Explain the draft tube theory with a sketch. **(10 Marks)**

b. Draw Kaplan turbine and label the parts legibly. Give the working proportions. **(10 Marks)**

OR

10 a. With the help of a neat sketch, explain main parts of a centrifugal pump. **(07 Marks)**

b. The diameter of an impeller of a centrifugal pump at inlet and outlet are 30cm and 60 cm respectively. The velocity of flow at outlet is 2.0 m/s and the vanes are set back at an angle of 45° at the outlet. Determine the minimum starting speed of the pump of manometer η is 70%. **(08 Marks)**

c. Write a short note on multistage pumps. **(05 Marks)**

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17CV45

Fourth Semester B.E. Degree Examination, Jan./Feb. 2021
Basic Geotechnical Engineering

Time: 3 hrs. Max. Marks: 100

Note: 1. ***Answer any FIVE full questions, choosing ONE full question from each module.***
2. ***Missing data if any, may be suitably assumed.***

Module-1

1 a. Sketch the phase diagram for a soil and indicate the volumes and weights of the phases on it. Define : Void ratio , Degree of saturation and Water content. **(10 Marks)**

b. What is the purpose of soil classification? Describe any three methods of field identification of soils. **(10 Marks)**

OR

2 a. Describe the laboratory method of determining the plastic limit and shrinkage limit of a soil. **(10 Marks)**

b. A soil sample with specific gravity of solids 2.70 has a mass specific gravity of 1.84. Assuming the soil to the perfectly dry, determine the void ratio. **(05 Marks)**

c. Describe the processes of soil formation. **(05 Marks)**

Module-2

3 a. Define 'Structure of a soil'. With neat sketches, describe the different types of structures of soil. **(10 Marks)**

b. With a neat sketch, explain the electrical diffuse double layer theory. **(10 Marks)**

OR

4 a. Discuss on the factors that influence the compaction of soils. Indicate their influence with illustrative sketches of compaction curves. **(10 Marks)**

b. Write a note on 'Proctor's Needle' and its use in field compaction control. **(04 Marks)**

c. Discuss the different compacting equipments used for compacting the soil in field. **(06 Marks)**

Module-3

5 a. List and explain the various factors that affect the permeability of a soil. **(10 Marks)**

b. The discharge of water collected from a constant head permeameter in 15 minutes is 500mℓ. The internal diameter of permeameter is 5cm and the measured difference in head between two gauging points 15cm vertically apart is 40cm. Calculate the co-efficient of permeability. If the dry weight of the 15cm long sample is 4.86N and the specific gravity of the solid is 2.65. Calculate the seepage velocity. **(10 Marks)**

OR

6 a. Define Darcy's Law. Derive the Laplace equation for seepage flow. **(10 Marks)**

b. A deposit of cohesionless soil with a permeability of 10^{-4} m/s has a depth of 6m with an impervious rock below. A sheet pile wall is driven into this deposit to a depth of 3m. The wall extends above the surface of the soil by 3m and 3m depth of water acts on one side and water level on the other side is 6.5m above the impervious rock. Sketch the flow net and determine the seepage quantity per meter length of the wall. **(05 Marks)**

c. What is a Flow net? What are its characteristics and uses? **(05 Marks)**

Module-4

7 a. Explain the method of determination of coefficient of consolidation by Logarithmic time method. **(07 Marks)**

b. With a neat sketch, explain Casagrande method of determination of preconsolidation pressure. **(07 Marks)**

c. In a consolidation teat, the void ratio of soil sample decreases from 1.20 to 1.10, when the pressure increases from 160 kN/m^2 to 320 kN/m^2. Determine the coefficient of consolidation, if $K = 8 \times 10^{-7}$ mm/s. **(06 Marks)**

OR

8 a. Explain the Mass – Spring Analogy theory of consolidation as applied to saturated clay soils. **(07 Marks)**

b. Explain normally consolidated, under consolidation and over consolidated soils. **(06 Marks)**

c. There is a bed of compressible clay of 4m thickness with pervious sand on top and impervious rock at the bottom. In a consolidation test on an undisturbed specimen of clay from this deposit, 90% settlement was reached in 4 hrs. The specimen was 20mm thick. Estimate the time in years for the building founded over this deposit to reach 90% of its final settlement. **(07 Marks)**

Module-5

9 a. Enumerate the various laboratory and field tests employed for determining shear strength of soil. Explain the triaxial compression test. **(10 Marks)**

b. What do you mean by sensitivity and thixotrophy in soils? **(04 Marks)**

c. The stresses at failure on failure plane in a cohesionless soil mass are : Shear stress = $4kN/m^2$ and Normal stress = $10kN/m^2$. Determine the resultant stress on the failure plane, the angle of internal friction of soil and the angle of inclination of failure plane to the major principle plane. **(06 Marks)**

OR

10 a. Explain the types of shear tests based on drainage conditions. **(06 Marks)**

b. With a neat sketch, explain total and effective stress paths. **(06 Marks)**

c. The results of shear box test are as follows :

Trail no	1	2	3	4
Normal stress, kN/m^2	50	100	200	300
Shear stress kN/m^2	36	80	154	235

Determine the shear parameters. Will the failure occur on the plane within the soil mass, when shear stress is 154 kN/m^2 and normal stress is $200kN/m^2$? **(08 Marks)**

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17CV46

Fourth Semester B.E. Degree Examination, Jan./Feb. 2021
Advanced Surveying

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. List the different methods of setting out simple circular curves. Explain the angular method of setting out simple circular curve by Rankines method of deflection angles. **(10 Marks)**

b. Two tangents intersect at a chainage 1000mt, the deflection angle being 28°. Calculate the necessary data to setout a simple circular curve of 200mt radius by Rankine's method of deflection angles. Take per interval as 10mt. **(10 Marks)**

OR

2 a. What is a transition curve? List the functions and essential requirements of an ideal transition curve. **(06 Marks)**

b. Two straight with a total deflection angle of 72° are to be connected by a compound curve of two branches of equal length. The Radius of the first branch is 300mt and that of the second branch is 400mt, chainage at intersection point is 1500mt. Calculate the chainages of tangent points and that of Point of Compound Curvature (PCC). **(08 Marks)**

c. Two parallel railway lines are to be connected by a reverse curve of different radii. If the lines are 10mt apart and maximum distance between tangent points measured parallel to the straight is 45mt, calculate the Radius of the second branch if that at first branch is 65mt, calculate the length at both the branches. **(06 Marks)**

Module-2

3 a. List the various factors, that are to be considered in the selection at site for base line and stations in triangulation survey. **(06 Marks)**

b. Write a note on classification of triangulation system. **(06 Marks)**

c. From an eccentric station S, 12.25mt to the west of the main station B, the following angles were measured

$\angle BSC = 76°25'32''$ $\angle CSA = 54°32'20''$

The stations S and C are to the opposite sides at the line AB, calculate the correct angle ABC, if the lengths AB and BC are 5286.5 and 4932.2m respectively. **(08 Marks)**

OR

4 a. State and explain laws of weights. **(08 Marks)**

b. The following are the mean valves observed in the measurement of three angles α, β and γ at one station.

$\alpha = 76°42'46''.2$ with weight 4

$\alpha + \beta = 134°36'32''.6$ with weight 3

$\beta + \gamma = 185°35'24''.8$ with weight 2

$\alpha + \beta + \gamma = 262°18'10''.4$ with weight 1

Calculate the most probable value of each angle. **(12 Marks)**

Module-3

5 a. Define the following terms:
   i) The Celestial sphere
   ii) The azimuth
   iii) The sensible horizon
   iv) The hour angle. **(08 Marks)**

   b. Find the G.M.T corresponding to the following LMT:
   i) 9h 10m 12s A.M at a place in longitude 42°36′W
   ii) 4h 32m 10s A.M, at a place in longitude 56°32′E **(12 Marks)**

OR

6 a. Define the following terms:
   i) Zenith and Wadir
   ii) The visible horizon
   iii) The prime vertical
   iv) The hour angle **(08 Marks)**

   b. The standard time meredian in India is 82°30′E. If the standard time at any instant is 20 hours 24 minutes 6 seconds, find the local mean time for two places having longitudes i) 20°E ii) 20°W. **(12 Marks)**

Module-4

7 a. Define the following terms:
   i) Vertical photograph
   ii) Flying height
   iii) Perspective projecting
   iv) Exposure station **(08 Marks)**

   b. A vertical photograph was taken at an altitude of 1200 meters above mean sea level. Determine the scale of the photograph for terrain lying at elevations of 80meters and 300meter if the focal length of the camera is 15cm. **(12 Marks)**

OR

8 a. List the reasons for keeping overlap in photographs. **(08 Marks)**

   b. Describe how mosaic differs from a map. **(06 Marks)**

   c. A section line AB appears to be 10.16cm on a photograph for which the focal length is 16cm. The corresponding line measures 2.54cm on a map which is to a scale 1/50,000. The terrain has an average elevation of 200m above mean sea level. Calculate the flying altitude at the aircraft, above mean sea level, when the photograph was taken. **(06 Marks)**

Module-5

9 a. Define Remote sensing. List the applications in Civil Engineering. **(10 Marks)**

   b. What is GIS? With a neat sketch, explain the components of GIS. **(10 Marks)**

OR

10 a. What is GPS? Explain the basic principles of GPS and its application in surveying. **(10 Marks)**

   b. Explain the working principle of total stations and list the salient features of total station. **(10 Marks)**

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CBCS SCHEME

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15CV42

Fourth Semester B.E. Degree Examination, Jan./Feb. 2021
Analysis of Determinate Structures

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Determine static and Kinematic in determinacies of the structures shown in Fig Q1(a) i), ii), iii).

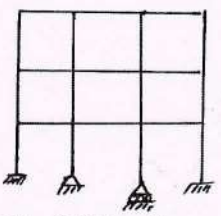

Fig Q1(a) – i)

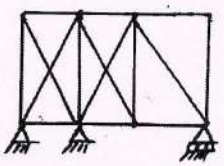

Fig Q1(a) – ii)

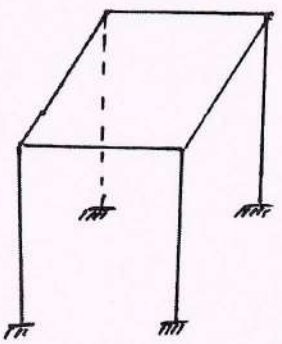

Fig Q1(a) – iii) **(08 Marks)**

b. Determine the forces in the numbered members of the loaded truss shown in Fig Q1(b) using method of sections.

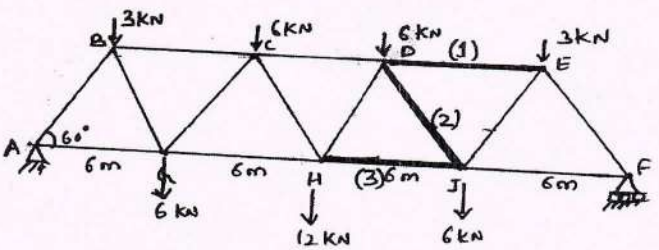

Fig Q1(b) **(08 Marks)**

OR

2 Determine forces in all the members of the truss shown in Fig Q2 using method of joints.

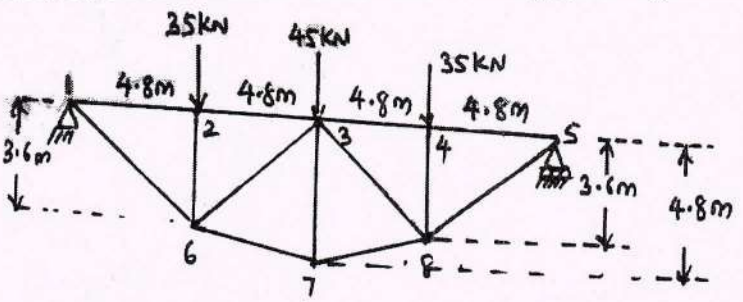

Fig Q2 **(16 Marks)**

Module-2

3 a. Determine maximum slope and maximum deflection for a simply supported beam subjected to a uniformly distributed load (throughout its span) using Double Integration method. **(06 Marks)**

b. Determine maximum slope and maximum deflection for the beam shown in Fig Q3(b) using Macaulay's method.

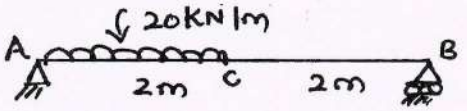

Fig Q3(b) **(10 Marks)**

OR

4 a. Obtain expression for maximum slope and maximum deflection for a Cantilever with a uniformly distributed load throughout its span, using moment-area method. **(06 Marks)**

b. Using Conjugate beam method determine maximum slope and maximum deflection for the simply supported beam shown in Fig Q4(b). $E = 204 \times 10^6$ kN/m^2 and $I = 50 \times 10^{-6}$m^4.

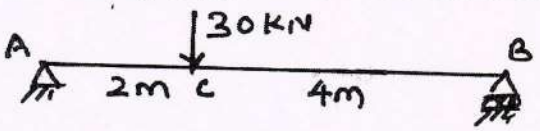

Fig Q4(b) **(10 Marks)**

Module-3

5 a. Determine vertical and horizontal deflections of the bent shown in Fig Q5(a), using Castigliano's method.

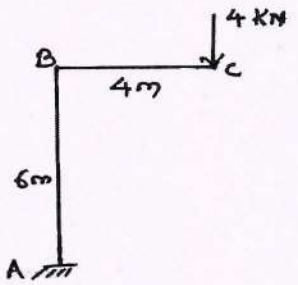

Fig Q5(a) **(12 Marks)**

b. Determine the expression strain energy stored in a member due to flexure, with usual notations. **(04 Marks)**

OR

6 Determine the vertical deflection at the free end of the truss shown in Fig Q6, using unit load method. The cross sectioned areas of members AD and DE are 1500mm^2, while those of other members are 1000mm^2. Take E = 200 kN/mm^2.

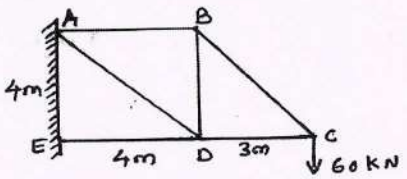

Fig Q6 **(16 Marks)**

Module-4

7 a. A three hinged parabolic arch of span 12m and central rise 3m is subjected to a uniformly distributed load of 30kN/m over its left half portion. Determine vertical reactions and horizontal thrust at the supports. Also determine Bending moment, Normal Thrust and Radial Shear at 3m from the left-hand support. **(12 Marks)**

b. A suspension cable 140m span and 14m central sag, carries a load of 1kN/m. calculate maximum and minimum tension in the cable. Find length of the cable. **(04 Marks)**

OR

8 A three hinged stiffening girder of a suspension bridge, of span 100m is subjected to two concentrated loads of 10kN each, placed at 20m and 40m respectively from the left end support. Determine bending moment and shear force at 30m from the left support. Also determine the maximum and minimum tensions in the supporting cable which has a central dip of 10m. **(16 Marks)**

Module-5

9 a. A simply supported beam has a span of 15m. A uniformly distributed load of 40 kN/m of length 5m passes over the beam from left to right. Using influence line diagram determine maximum bending movement at a section 6m from the left end. **(04 Marks)**

b. Four point loads 16, 30, 30 and 20kN have a centre to centre spacing of 2m between consecutive load and pass over a girder of 30m span from left to right with 20kN load leading. Calculate maximum bending moment and shear force at 8m from the left end, using influence line diagrams. **(12 Marks)**

OR

10 a. A train of concentrated loads shown in Fig Q10(a) move from left to right on a simply supported girder of span 16m. Determine absolute maximum bending moment developed in the beam.

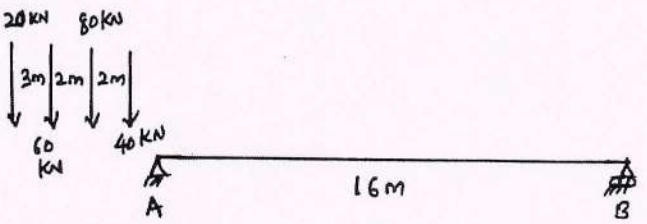

Fig Q10(a) **(08 Marks)**

b. Determine maximum forces in the members CE, DE and DF of the truss shown in Fig Q10(b), due to the dead load of 10 kN/m covering the entire span and a moving load of 20kN/m longer than the span passing over the truss. Consider the loads are transmitted through the lower chord.

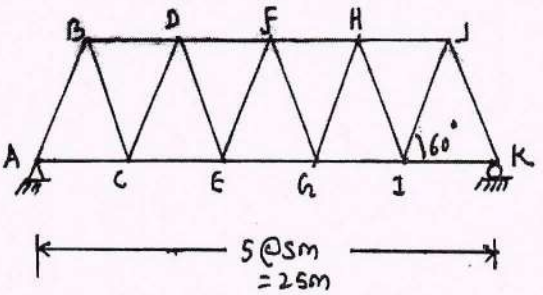

Fig Q10(b) **(08 Marks)**

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15CV43

Fourth Semester B.E. Degree Examination, Jan./Feb.2021
Applied Hydraulics

Time: 3 hrs. Max. Marks: 80

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. State and explain Buckingham π-theorem. **(06 Marks)**

b. Derive the scale ratios of the following as per Reynolds model law:
(i) Time (ii) Discharge (iii) Force (iv) Acceleration
(v) Work (vi) Power **(06 Marks)**

c. A spillway model is constructed such that the velocity and discharge in the model are respectively 2 m/s and 3 m^3/s. If the velocity in the prototype is 20 m/s, what is the length scale ratio and the discharge in the prototype? **(04 Marks)**

OR

2 a. Explain the procedure of determining the metacenter in the laboratory. **(08 Marks)**

b. The efficiency η of a fan depends on density ρ, dynamic viscosity μ of the fluid, angular velocity ω, diameter D of the rotor and discharge Q. Express η as,

$$\eta = \phi\left[\frac{Q}{\omega D^3}, \frac{\mu}{\rho\omega D^2}\right]$$

where ϕ is the function. **(08 Marks)**

Module-2

3 a. Differentiate between:
(i) Hydraulic mean depth and hydraulic depth.
(ii) Steady flow and unsteady flow.
(iii) Critical flow, subcritical flow and supercritical flow. **(06 Marks)**

b. For most economical triangular section, show that crest angle is 90°. **(04 Marks)**

c. Water is flowing through a circular open channel at the rate of 500 lps, when the channel bed slope is 1 in 10000. Manning's n = 0.015. Find the diameter of channel if flow depth is 0.75 times the diameter. **(06 Marks)**

OR

4 a. Define specific energy. Draw specific energy curve and explain salient points. For rectangular channel prove that $E_{min} = 1.5y_c$ at critical flow condition. E_{min} = minimum specific energy, y_c = Critical depth . **(10 Marks)**

b. A concrete lined circular channel of 3.6 m diameter has a bed slope of 1 in 600. Determine velocity and discharge for maximum velocity condition. Chezy's C = 50. **(06 Marks)**

Module-3

5 a. Derive the relationship between sequent depths of hydraulic jump in rectangular jump in terms of approaching Froude number. **(08 Marks)**

b. A horizontal rectangular channel 4 m wide carries a discharge of 16 m^3/s. Determine whether a jump occurs at an initial depth of 0.5 m or not. If a jump occurs, determine the sequent depth and energy loss. **(08 Marks)**

OR

6 a. In a rectangular channel, the Froude number before jump $F_1 = 2.5$. Compute the Froude number after jump. **(04 Marks)**

b. Give the classification of GVF profiles with neat sketches. **(12 Marks)**

Module-4

7 a. Show that for a free jet of water sriking at the center of semicircular vane, the maximum efficiency occurs when vane velocity is $\frac{1}{3}$ of jet velocity and $\eta_{max} = 59.2\%$. **(08 Marks)**

b. A jet of water having velocity 45 m/s impinges without shock on a series of curved vanes moving at 15 m/s, the direction of motion of vanes being 20° to that of jet. The relative velocity at the outlet is 0.9 of that at inlet and the absolute velocity of water at the exit is to be normal to the motion of vanes. Find : (i) Vane angles at entrance and exit
(ii) Hydraulic efficiency. **(08 Marks)**

OR

8 a. Give the classification of turbines based on different criteria. **(08 Marks)**

b. A penstock supplies water form a reservoir to the Pelton wheel with a gross head of 500 m. One third of the gross head is lost in friction in the penstock. The rate of flow of water through the nozzle fitted at the end of the penstock is 2 m^3/s. The angle of deflection of jet is 165° when the vanes are stationary. Determine the power given by the water to the runner and also hydraulic efficiency. Take $C_V = 1.0$ and Speed ratio = 0.45. **(08 Marks)**

Module-5

9 a. Differentiate between :
(i) Francis turbine and Kaplan turbine.
(ii) Unit discharge and actual discharge.
(iii) Unit speed and specific speed. **(06 Marks)**

b. What is draft tube? What are its functions? **(04 Marks)**

c. A centrifugal pump running at 1450 rpm discharges 700 lps against a head of 23 m. If the diameter of the impeller is 250 mm and width is 50 mm, find the vane angle at the outer periphery. Take $\eta_{man} = 75\%$. **(06 Marks)**

OR

10 a. Define minimum starting speed of a centrifugal pump and derive the expression for the same. **(06 Marks)**

b. Define : (i) Suction head, (ii) Delivery head, (iii) Static head
(iv) Manometric head **(04 Marks)**

c. A Kaplan turbine produces 60000 kW power under net head of 25 m with an overall efficiency of 90%. Taking speed ratio = 1.6 and flow ratio = 0.5 with hub diameter = 0.35 times diameter, find the diameter and speed of the turbine. **(06 Marks)**

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CBCS SCHEME

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15CV45

Fourth Semester B.E. Degree Examination, Jan./Feb. 2021
Basic Geo-Technical Engineering

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. With the help of three phase diagram, explain :
i) Void ratio
ii) Porosity
iii) Water content
iv) Degree of saturation. **(08 Marks)**

b. Explain the laboratory procedure to determine the water content present in the soil using hot air oven. **(04 Marks)**

c. An oven dried soil weighing 1.854N is placed in a pyknometer. The total weight of the pyknometer along with soil and water is 15.51N. The pyknometer with water alone weighs 14.34N. Determine the specific gravity of the soil. **(04 Marks)**

OR

2 a. Define Liquid limit, plastic limit and shrinkage limit. **(06 Marks)**

b. Explain Indian standard soil classification system. **(06 Marks)**

c. Determine the dry density and void ratio. Given $V_b = 26kN/m^3$, W = 16%, G = 2.67. **(04 Marks)**

Module-2

3 a. Explain with sketches, the common clay minerals. **(08 Marks)**

b. A cohesive soil yields a maximum dry density of $18kN/m^3$ at on OMC of 16% during a standard proctor test. If G = 2.65, What is the degree of saturation? **(08 Marks)**

OR

4 a. Distinguish between standard proctor and modified proctor tests. **(04 Marks)**

b. Explain the laboratory procedure for conducting test on soil to determine its maximum dry density and optimum moisture content. **(06 Marks)**

c. What are the effects of compaction? **(06 Marks)**

Module-3

5 a. What is a flow net? What are the uses and characteristics of flow nets? **(08 Marks)**

b. Compute the quantity of water seeping under a weir per day for which the flow net has been constructed. The coefficient of permeability is 2×10^{-2}mm/s, $n_f = 5$ and $n_d = 18$. The difference in water level between O/S and D/S is 3.0m. The length of weir is 60m. **(08 Marks)**

OR

6 a. What are the factors affecting permeability? Explain them briefly. **(06 Marks)**

b. A soil sample 90mm high and 6000mm is in cross-section was subjected to a falling-head permeability test. The head fell from 500mm to 300mm in 1500s. The permeability of the soil was 2.4×10^{-3} mm/s. Determine the diameter of its stand pipe. **(10 Marks)**

Module-4

7 a. Explain Mass-Spring Analogy. **(08 Marks)**

b. Explain over consolidated soil, normally consolidated soil and under consolidated soil. **(08 Marks)**

OR

8 a. Explain square root of time fitting method. **(06 Marks)**

b. A 20m thick isotropic clay stratum over lies an imperrious rock. The coefficient of consolidation of soil is 5×10^{-8} mm^2/s. Find the time required for 50% and 90% consolidation. Time factors are 0.2 and 0.85 for u = 50% and u = 90% respectively. **(10 Marks)**

Module-5

9 a. Explain Mohr–Coulomb failure theory of soil. **(04 Marks)**

b. What are the factors affecting the shear strength of soil. **(04 Marks)**

c. A direct shear test was conducted on a soil and the following results were obtained.

Normal stress	kN/m^2	55	105	145
Shear stress	kN/m^2	30	36	41

Determine graphically, the cohesive strength and the angle of shearing resistance. **(08 Marks)**

OR

10 a. Explain the list procedure involved in conducting the direct shear list on soil. **(06 Marks)**

b. Define thixotrophy and sensitivity. **(04 Marks)**

c. When an unconfined compression test is conducted on a cylinder of soil, it fails under an axial stress of $120kN/m^2$. The failure plane makes an angle of 50° with the horizontal. Determine the cohesion and the angle of internal friction of soil. **(06 Marks)**

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