CBCS SCHEME

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18CV32

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
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 the four elastic constants. **(06 Marks)**

b. Derive an expression for the displacement of a tapering circular bar subjected to an axial force. **(08 Marks)**

c. The modulus of elasticity and shear modulus of a bar is 200Gpa and 80Gpa respectively. Compute the bulk modulus and reduction in diameter of a circular bar 36mm diameter and 3m long, when stretched by 3mm. **(06 Marks)**

OR

2 a. Write a note on temperature stress in simple bars. **(05 Marks)**

b. Derive the relation between modulus of elasticity, modulus of rigidity and Poisson's ratio. **(08 Marks)**

c. A composite tube consists of a steel tube 165mm internal diameter and 15mm thick enclosed by an aluminium tube 200mm internal diameter and 15mm thick. The composite tube carries an axial load of 1500kN. Compute the stresses in each material, load carried by each material and the compression of the composite tube, if its length is 300mm. E_s = 200Gpa and E_{AL} = 70Gpa. **(07 Marks)**

Module-2

3 a. Explain maximum shear stress theory of failure. **(06 Marks)**

b. A closed cylindrical steel vessel 8m long and 2m internal diameter is subjected to an internal pressure of 5MPa with the thickness of the vessel being 36mm. Compute hoop stress, longitudinal stress, maximum shear stress, change in length, change in diameter and change in volume. Assume E = 200 kN/mm^2 and μ = 0.3. **(08 Marks)**

c. An element is subjected to a tensile stress of 120N/mm^2 on the vertical plane and another compressive stress of 80N/mm^2 on the horizontal plane. Compute the normal and tangential stresses on a plane making an angle of 30° anticlockwise with the vertical plane. **(06 Marks)**

OR

4 a. The stresses acting at a point in a two dimensional system is shown in Fig.Q4(a). Determine the principal stresses and planes, maximum shear stress and planes, normal and shear stresses on plane AB. **(10 Marks)**

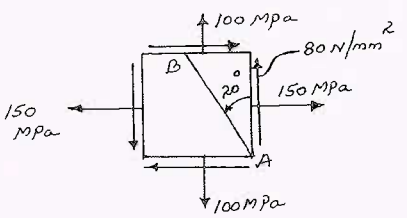

Fig.Q.4(a)

b. Differentiate between thin and thick cylinders. (03 Marks)

c. Compute the thickness of the wall of a thick cylinder subjected to an internal pressure of 40 N/mm^2. The internal diameter of the cylinder is 200mm and the permissible hoop stress is 140MPa. Sketch the hoop stress and radial pressure across the thickness assuming zero external pressure. (07 Marks)

Module-3

5 a. Define SF, BM and point of contraflexure. (03 Marks)

b. A simply supported beam AB of span L is subjected to a concentrated load at distance 'a' from left support A. Develop expressions for SF and BM. Sketch SFD and BMD. (05 Marks)

c. Sketch SFD and BMD for the beam shown in Fig.Q.5(c) indicating the salient points. (12 Marks)

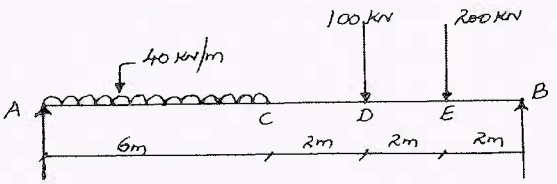

Fig.Q.5(c)

OR

6 a. Sketch SFD and BMD for the beam shown in Fig.Q.6(a) indicating salient points.

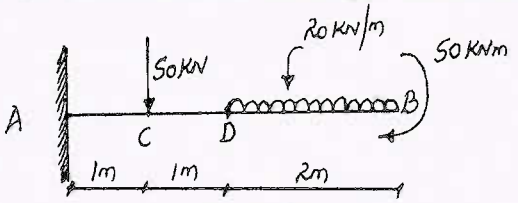

Fig.Q.6(a)

(08 Marks)

b. Sketch SFD and BMD for the beam shown in Fig.Q.6(b) indicating salient points including point of contraflexure. (12 Marks)

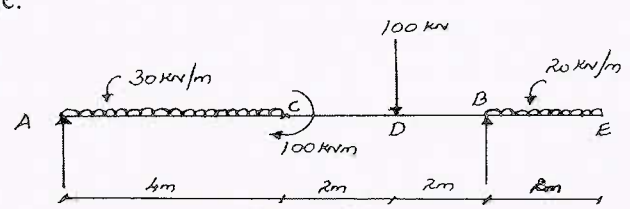

Fig.Q.6(b)

Module-4

7 a. Derive the equation of pure bending $\frac{M}{I} = \frac{\sigma}{y} = \frac{E}{R}$ with usual notations. (10 Marks)

b. A shaft of hollow C/S rotates at 200rpm transmitting a power of 800kW with internal diameter = 0.8 times external diameter. Computer the diameters if the maximum shear stress is limited to 100N/mm^2 and the angle of twist to 1° in a length of 4m. Assume that the maximum torque is 30% greater than the mean torque and G = 80GPa. (10 Marks)

OR

8 a. State the assumptions made in the theory of pure torsion. **(05 Marks)**

b. Derive an expression for power transmitted by a shaft. **(05 Marks)**

c. A I-section consists of flanges 200 × 15 with web 10mm thick. Total depth of the section is 500mm. If the beam carries a UDL of 35kN/m over a span of 8m, computer the bending and shear stresses at centre and support respectively. Sketch their distributions. **(10 Marks)**

Module-5

9 a. Derive an expression for slope and deflection in a simply supported subjected to UDL throughout. Calculate the maximum slope and deflection. **(06 Marks)**

b. Define:

i) Buckling load

ii) Effective length

iii) Slenderness ratio. **(06 Marks)**

c. Compute the crippling loads using Euler's and Rankine's formula for a hollow circular column 200mm external diameter and 25mm thick. The length of the column is 4m with both ends hinged. Assume E = 200GPa, Rankine's constants σ_c = 320MPa and a = 1/7500. **(08 Marks)**

OR

10 a. Derive an equation for buckling load in a long column with both ends hinged using Euler's column theory. **(08 Marks)**

b. Determine the slopes at A and B, deflections at C, D and E in the beam shown in Fig.Q.10(b) in terms of EI. **(12 Marks)**

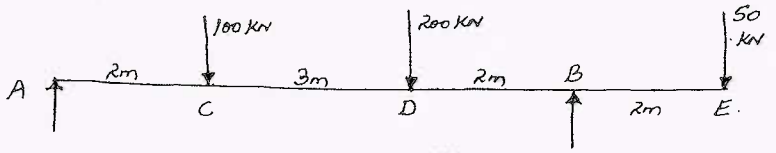

Fig.Q.10(b)

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CBCS SCHEME

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18CV33

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Fluid Mechanics

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Define the following terms: (i) Ideal fluids and Real fluids.
(ii) Surface tension and capillarity. **(06 Marks)**

b. State Newton's law of viscosity. Derive an expression for the same. **(06 Marks)**

c. The space between the two square flat parallel plates is filled with oil. Each side of the plate is 60 cm. The thickness of the oil film is 12.5 mm. The upper plate which moves at 2.5 m/s requires a force of 98.1 N to maintain the speed. Determine the dynamice viscosity of the oil in poise. Also find the kinematic viscosity of the oil in stokes, if the specific gravity of the is 0.95. **(08 Marks)**

OR

2 a. Explain with neat sketches the differential manometer and simple manometer. **(06 Marks)**

b. Calculate the gauge pressure and absolute pressure at a point 3 m below the free surface of a liquid having a density of 1.53×10^3 kg/m^3, if the atomospheric pressure is equivalent to 750 mm of mercury. **(06 Marks)**

c. Petrol of specific gravity 0.8 flows upwards through a vertical pipe. A and B are two points in the pipe, B being 0.3 m higher than A, connections are led from A and B to a U tube containing mercury. If the difference of pressure between A and B is 0.18 kgf/cm^2. Find the difference in the mercury level in the differential manometer. **(08 Marks)**

Module-2

3 a. Derive an expression for total pressure and centre of pressure on an inclined plane surface submerged in the liquid. **(08 Marks)**

b. A circular plate of 3 m diameter is immersed in water in such a way that its greatest and least depth below the free surface are 4 m and 1.5 m respectively. Determine the total pressure on one face of the plate and position of centre of pressure. **(06 Marks)**

c. In a two dimensional flow $\phi = 3xy$ and $\psi = \frac{3}{2}\left(y^2 - x^2\right)$. Determine the velocity components at the points (1, 3) and (3, 3). Also find the discharge passing between the streamlines passing through the points given above. **(06 Marks)**

OR

4 a. Define : (i) Uniform flow and Non uniform flow.
(ii) Steady and Unsteady flow.
(iii) Velocity potential and stream function. **(06 Marks)**

b. A vertical gate closes a horizontal tunnel 3 m high and 3 m wide running full with water. The pressure at the bottom of the gate is 196.2 kN/m^2. Determine the total pressure on the gate and position of the centre of pressure. **(08 Marks)**

c. Show that streamlines and equipotential lines form a set of perpendicular lines. **(06 Marks)**

Module-3

5 a. Obtain an expression for Euler's equation of motion along a stream line and deduce it to Bernoulli's equation. **(08 Marks)**

b. Define impulse momentum equation and give its applications. **(04 Marks)**

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

OR

6 a. Derive the equation for discharge through venturimeter. **(08 Marks)**

b. A venturimeter is to be fitted in a pipe of 0.25 m diameter where the pressure head is 7.6 m of flowing liquid and the maximum flow is 8.1 m^3/minute. Find the diameter of the throat of the venturimeter. Take $C_d = 0.96$. **(06 Marks)**

c. A pipeline carrying oil of specific gravity of 0.87 changes in diameter from 200 mm at a point A to 500 mm diameter at point B which is 4 m higher. If the pressure at A and B are 9.81 N/cm^2 and 5.886 N/cm^2 respectively and the discharge is 200 l/s. Determine the loss of head and direction of flow. **(06 Marks)**

Module-4

7 a. Define the hydraulic coefficients (C_C, C_d, C_V) of an orifice and obtain the relation between them. **(06 Marks)**

b. Explain the classification of orifice and mouthpiece based on their shape, size, sharpness and discharge. **(06 Marks)**

c. Water flows through a triangular right angled weir first and then over a rectangular weir of 1 m width. The C_d values of triangular and rectangular weir are 0.6 and 0.7 respectively. If the depth of water over the triangular weir is 360 mm, find the depth of water over the rectangular weir. **(08 Marks)**

OR

8 a. Explain Cipolletti notch. What is the advantage of Cipolletti notch over trapezoidal notch. **(06 Marks)**

b. Water discharge at the rate of 98.2 litre/sec through a 120 mm diameter vertical sharp edged orifice placed under a constant head of 10 m. A point on the jet measured from the venacontracta of the jet has co-ordinate (4.5, 0.54). Find the coefficients C_C, C_v, C_d of the orifice. **(08 Marks)**

c. Derive an expression for discharge through a V-notch. **(06 Marks)**

Module-5

9 a. Explain major and minor losses in a pipe flow. Give an expression for head loss due to sudden expansion in pipe line. **(08 Marks)**

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

c. What is the maximum permissible velocity in a cast iron pipeline 10 mm diameter and 15 mm thick which can be suddenly stopped by a valve at the outlet end of the pipe without letting the rise of pressure in the pipe to exceed 1.545×10^3 kN/m^2.

Take E for cast iron = 123.606×10^9 N/m^2, K for water = 206.01×10^7 N/m^2. Neglect effect of Poisson's ratio. **(06 Marks)**

OR

10 a. Define the term compound pipe and equivalent pipe. Derive the expression for diameter of equivalent pipes. **(06 Marks)**

b. Explain Hardy cross method used in pipe networks. **(06 Marks)**

c. The population of a city is 8,00,000 and it is to be supplied with water from a reservoir 6.4 km away. Water is to be supplied at the rate of 140 litres per head per day and half the supply is to be delivered in 8 hours. The full supply level of the reservoir is RL 180.00 and its lowest water level is RL 105.00. The delivery end of the main is at RL 22.50 and the head required there is 12 m. Find the diameter of the pipe. Take f = 0.04. **(08 Marks)**

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18CV34

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
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. Mention the importance of stones Bricks and Timber as construction materials. **(06 Marks)**
b. Explain the manufacture process of Brick with necessary flow chart. **(08 Marks)**
c. What is Bulking of Sand? Explain its importance in construction field. **(06 Marks)**

OR

2 a. What are the requirements of good building stones? **(06 Marks)**
b. What are the constituents of good brick earth? Explain. **(06 Marks)**
c. Which are the methods of seasoning of Timber? Describe them brief. **(08 Marks)**

Module-2

3 a. Which are the functions of foundation? Explain them briefly. **(06 Marks)**
b. Sketch the plan of alternate courses 1 brick thick wall in English bond. Mention its essential features. **(08 Marks)**
c. What are the General principles to be observed in stone masonry? **(06 Marks)**

OR

4 a. Differentiate between strip footing and strap footing with sketches. **(06 Marks)**
b. Sketch the elevation of Flemish bond and mention its special features. **(08 Marks)**
c. Differentiate between uncoursed rubble masonry and Random rubble masonry with a sketch. **(06 Marks)**

Module-3

5 a. Draw a neat sketch of an arch and Label its parts. **(06 Marks)**
b. Explain the procedure for laying Marble flooring in Grand floor with a sketch. **(06 Marks)**
c. Mention the requirements of good roof. Draw the sketch of wooden king post truss (half part). **(08 Marks)**

OR

6 a. Discuss various modes of failure of an arch. What are the remedies? **(06 Marks)**
b. Explain the procedure for laying Mosaic flooring in ground floor with a sketch. **(06 Marks)**
c. Draw the sketch of wooden Queen post truss (half part) and label its parts. **(08 Marks)**

Module-4

7 a. Draw a sketch of a wooden door frame with shutter and label its parts. **(06 Marks)**
b. What are the requirements of good stair? **(06 Marks)**
c. What is meant by shoring? Explain Raking shore with a neat sketch. **(08 Marks)**

OR

8 a. Write a note on Bay window with a sketch. **(06 Marks)**

b. Plan a dog legged stair for a building in which the vertical distance between the floors is 3.6m. The stair hall measure 2.5m × 5m. **(08 Marks)**

c. Write a note on Revolving Door with a neat sketch. **(06 Marks)**

Module-5

9 a. What are the requirements of plastering? **(06 Marks)**

b. Explain various causes of Dampness in building. **(06 Marks)**

c. Describe the constituents of a paint, mentioning the specific functions of each. **(08 Marks)**

OR

10 a. Write a note on various defects in plastering. **(06 Marks)**

b. What are the ill effects of dampness in building? Explain them briefly. **(06 Marks)**

c. Describe the procedure of painting: i) Newly plastered surfaces ii) Iron and steel surfaces. **(08 Marks)**

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18CV35

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
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 and explain plane and Geodetic surveying. **(08 Marks)**

b. Name and Explain important sources of Errors in surveying. **(06 Marks)**

c. Explain the terms Plans and Maps. Mention their application. **(06 Marks)**

OR

2 a. A field tape, standardized at 20°C measured 100.0056m. Determine the temperature at which it will be exactly of the nominal length of 100m. Take $\alpha = 11.2 \times 10^{-6}$ per °C. **(06 Marks)**

b. Name and explain the various instruments for chaining in surveying. **(14 Marks)**

Module-2

3 a. Distinguish between prismatic and surveyor's compass. **(08 Marks)**

b. Name and briefly explain temporary adjustments for prismatic compass. **(06 Marks)**

c. Define local attraction and explain the Elimation of local attraction in compass surveying. **(06 Marks)**

OR

4 a. Explain with sketches an open traverse and closed traverse. **(06 Marks)**

b. Determine the correct magnetic bearings of the liner. The following bearings were observed in running a closed traverse:

Line	F.B	B.B
AB	71° 05′	250° 20′
BC	110° 20′	292°35′
CD	161° 35′	341° 45′
DE	220° 50′	40° 05′
EA	300° 50′	121° 10′

(14 Marks)

Module-3

5 a. Define leveling and explain it. **(04 Marks)**

b. Describe with neat sketch parts of dumpy level. **(16 Marks)**

OR

6 a. Explain the terms mentioning their purpose:

i) Station
ii) Back sight
iii) Turning point
iv) Height of Instruments. **(08 Marks)**

b. A level is set up on an extended line BA in a position 70m from A and 100m from B, reads 1.684m on a staff held at A and 2.122m on a staff held at B, the bubble having been carefully brought to the centre of its run before each reading. It is known that the reduced levels of the tops of the pegs at A and B are 89.62m and 89.222m respectively. Find:
   i) The Collimation error.
   ii) The Reading that would have been obtained has there been no Collimation error. **(12 Marks)**

Module-4

7 a. Explain the working operations of plane table. **(06 Marks)**
   b. Explain Radiation and Traversing methods of plane table surveying with sketches. **(08 Marks)**
   c. Describe with sketches two-point problem in plane table surveying. **(06 Marks)**

OR

8 a. Explain briefly Intersection and Resection Methods of plane table surveying with sketches. **(10 Marks)**
   b. Describe the different Errors in plane table surveying. **(10 Marks)**

Module-5

9 a. What are the General methods of determining Areas? **(04 Marks)**
   b. A series of offsets were taken from a Chain line to a curved boundary line at Intervals of 15 meters in the following order 0, 2.65, 3.8, 3.75, 4.65, 3.6, 4.95, 5.85m. Computer the area between the chain line, the curved boundary and the end offsets by
   i) Average ordinate rule
   ii) Trapezoidal rule
   iii) Simpson's rule. **(16 Marks)**

OR

10 a. Explain with sketch planimeter. **(07 Marks)**
   b. What are the methods of locating Contours in Surveying? **(08 Marks)**
   c. Explain the calculation of the volume of the capacity of a reservoir with any one relationship. **(05 Marks)**

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CBCS SCHEME

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18CV36

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
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 the scope of Geology in the field of Civil Engineering. (06 Marks)
b. Explain the Internal structure and Composition of Earth, with neat sketch. (08 Marks)
c. Write description of any two carbonate group of minerals. (06 Marks)

OR

2 a. Explain the physical properties of Mineral Hardness, Luster , Structure and Fracture. (12 Marks)
b. Write the description of Minerals :
i) Asbestos ii) Galena iii) Hematite iv) Gypsum. (08 Marks)

Module-2

3 a. Define Igneous Rocks. Explain Formation and Forms of Igneous Rocks. (08 Marks)
b. Write short note on Metamorphism. (06 Marks)
c. Explain briefly Soil profil and Drainage patterns. (06 Marks)

OR

4 a. Write briefly selection of Rocks as materials for construction. (10 Marks)
b. Explain the classification of sedimentary rocks and write the description of Sand stone and Conglomerate. (10 Marks)

Module-3

5 a. Define Fault. With relevant sketch, explain parts and type of faults. (12 Marks)
b. Write short note on Rock Quality Determination and Rock Structure Rating. (08 Marks)

OR

6 a. Define Dip and Strike. Discuss briefly selection of site for Dams. (12 Marks)
b. Write difference between Faults and Joints. (08 Marks)

Module-4

7 a. What is Aquifers? With neat sketch, explain types of Aquifers. (10 Marks)
b. Discuss the Artificial Recharge and Rain Water Harvesting Methods. (10 Marks)

OR

8 a. Explain with a neat sketch, Ground Water Investigation by Electrical Restivity Method. (10 Marks)
b. Write short note on Hydrological cycle and Water pollution. (10 Marks)

Module-5

9 a. Define Earthquake. With a neat sketch, explain Seismograph. (08 Marks)
b. Write briefly Development of Remote Sensing. (06 Marks)
c. Define Topography and Contour Maps. (06 Marks)

OR

10 Write short note on :
a. Global positioning system b. Tsunami.
c. Soil creep. d. Components of GIS. (20 Marks)

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CBCS SCHEME

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17CV/CT32

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
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) Stress (ii) Strain **(04 Marks)**

b. Derive the expression for elongation of tapering circular bar due to an axial load P. Use standard notations. **(08 Marks)**

c. A circular bar of uniform cross sectional area of 1000 mm^2 is subjected to forces as shown in Fig. Q1 (c). If Young's modulus for the material is 200 GPa, determine the total deformation. **(08 Marks)**

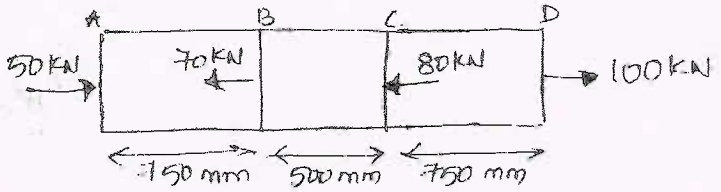


Fig. Q1 (c)

OR

2 a. Derive the relationship between Young's modulus, modulus of rigidity and Poisson's ratio. **(06 Marks)**

b. A bar of 30 mm diameter is subjected to a pull of 60 kN. The measured extension on guage length of 200 mm is 0.1 mm and change in diameter is 0.004 mm. Calculate (i) Young's modulus (ii) Poisson's ratio (iii) Bulk modulus. **(06 Marks)**

c. A steel rod of 200 mm diameter passes centrally through a copper tube of 50 mm external diameter and 40 mm internal diameter. The tube is closed at each end and the nuts are tightened on the projecting points of rod. If the temperature of the assembly is raised by 50°C. Calculate the temperature stresses developed in copper and steel.

Take $E_s = 200\ GN/m^2$; $E_c = 100\ GN/m^2$ and $\alpha_s = 12\times10^{-6}$ per °C and

$\alpha_c = 18\times10^{-6}$ per°C. **(08 Marks)**

Module-2

3 a. Define (i) Principal stress (ii) Principal plane **(04 Marks)**

b. Derive expression for normal stress and tangential stress for a member subjected to uniaxial loading. **(06 Marks)**

c. At a point in a strained material, the stresses are as shown in Fig. Q3 (c). Determine the

(i) Principal stress

(ii) Normal and tangential stress on the plane AB.

(iii) Maximum shear stress. **(10 Marks)**

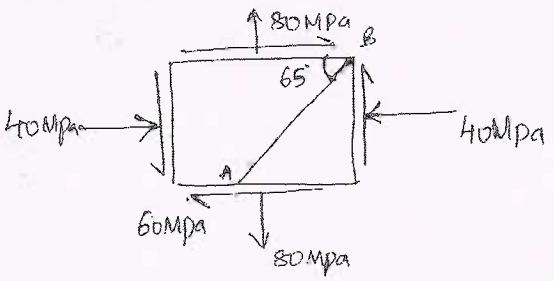


Fig. Q3 (b)

OR

4 a. Derive expression for hoop stress and longitudinal stress for a thin cylindrical vessel subjected to an internal fluid pressure. **(10 Marks)**

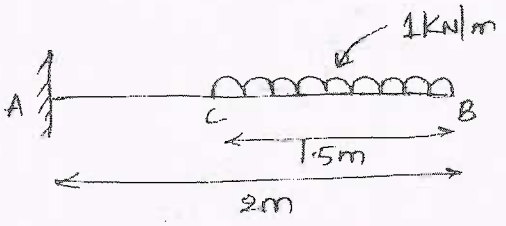
b. Determine the maximum and minimum hoop stress across the section of a pipe of 400 mm internal diameter and 100 mm thick, when the pipe contains a fluid at a pressure of 8 N/mm^2. Also sketch the radial pressure distribution and hoop stress distribution. **(10 Marks)**

Module-3

5 a. Derive the relationship between load intensity, shear force and bending moment. **(08 Marks)**

b. For a simply supported beam subjected to a UDL of intensity W/unit length throughout plot the SFD and BMD and prove that maximum bending moment is $\frac{\omega l^2}{8}$. **(06 Marks)**

c. For the Cantilever beam shown in Fig. Q5 (c), plot the SFD and BMD.

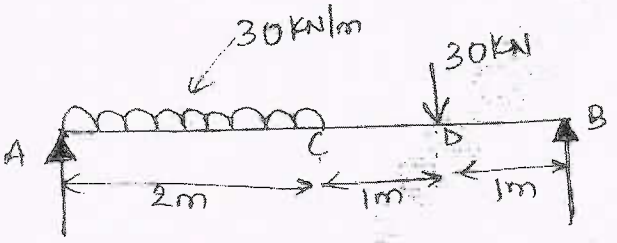


(06 Marks)

Fig. Q5 (c)

OR

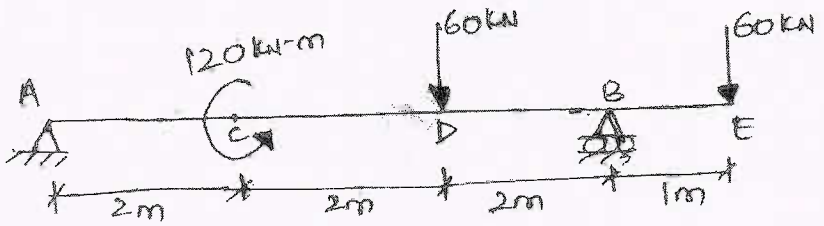
6 a. A simply supported beam is subjected to a UDL of 30 kN/m together with a point load of 30 kN as shown in Fig. Q6 (a). Draw SFD and BMD. Find also point of zero shear and its corresponding BM.



(10 Marks)

Fig. Q6 (a)

b. For the overhanging beam shown in Fig. Q6 (b), plot the SFD and BMD. Locate points of contraflexure if any.



(10 Marks)

Fig. Q6 (b)

Module-4

7 a. State the different theories of failure. Explain any two briefly. **(10 Marks)**

b. Derive the torsion equation with usual notations. **(10 Marks)**

OR

8 a. A solid shaft is to transmit 300 kN-m at 100 rpm. If the shear stress of the material should not exceed 80 MPa, find the diameter required. What percentage saving in weight would be obtained if this shaft is replaced by a hollow one whose $d_i = 0.6d_0$, the length, material and shear stress remaining same. **(10 Marks)**

b. Determine the diameter of a bolt which is subjected to an axial pull of 9 kN together with a transverse shear force of 4.5 kN using,

(i) Maximum principal stress theory

(ii) Maximum principal strain theory.

Given the elastic limit in tension = 225 N/mm^2; Factor of safety = 3

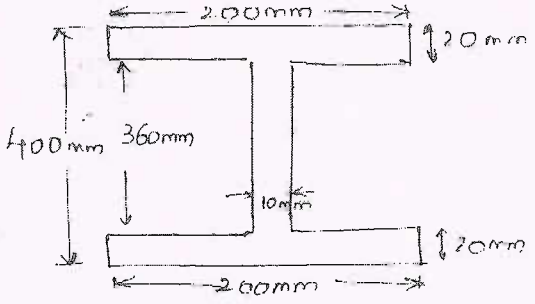
Poisson's ratio = 0.3 **(10 Marks)**

Module-5

9 a. What are the assumptions in bending theory? **(04 Marks)**

b. Derive the equation $\frac{M}{I} = \frac{\sigma}{y} = \frac{E}{R}$ of theory of simple bending with usual notations. **(08 Marks)**

c. A rolled steel joint of I-section has the dimensions as shown in Fig. Q9 (c). This beam of I-section carries a UDL of 40 kN/m run on a span of 10 m. Calculate the maximum stress produced due to bending.



(08 Marks)

Fig. Q9 (c)

OR

10 a. State the assumptions made in Euler's theory. **(04 Marks)**

b. Derive the Euler's equation for buckling load on an elastic column with both ends pinned or hinged. **(08 Marks)**

c. A simply supported beam of length 40 m is subjected to a UDL of 30 kN/m over the whole span and deflects 15 mm at the centre. Determine the crippling loads when this beam is used as a column with the following conditions:

(i) One end fixed and other end hinged.

(ii) Both ends pin jointed.

Take length of beam, l =4000 mm and UDL, $\omega = 30$ kN/m, Deflection at centre = 15 mm. **(08 Marks)**

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CBCS SCHEME

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17CV33

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
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 with symbols and units:
i) Mass density ii) Specific weight iii) Specific gravity. **(06 Marks)**

b. An oil film of thickness 1.5mm is used for lubrication between a square plate of size 0.9m × 0.9m and an inclined plane having an angle of inclination 20°. The weight of the square is 392.4N and it slides down the plane with a uniform velocity of 0.2m/s. Find the dynamic viscosity of the oil. **(06 Marks)**

c. Find the manometer reading 'h' for the Fig.Q.1(c) shown below. **(08 Marks)**

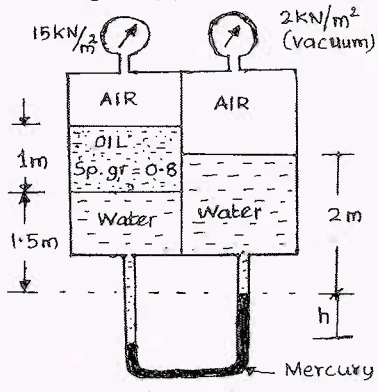

Fig.Q.1(c)

OR

2 a. The surface tension of water in contact with air is given as 0.0725 N/m. The pressure outside the droplet of water of diameter 0.02mm is atmospheric (10.32 N/cm^2). Calculate the pressure within the droplet of water. **(04 Marks)**

b. A shaft of diameter 120mm is rotating inside a journal bearing of diameter 122mm at a speed of 360rpm. The space between the shaft and the bearing is filled with a lubricating oil of viscosity 6 poise. Find the power absorbed in oil if the length of bearing is 100mm. **(08 Marks)**

c. State and prove the Pascal's law. **(08 Marks)**

Module-2

3 a. Derive an expression for the force exerted on a submerged vertical plane surface by the static liquid and locate the position of centre of pressure. **(10 Marks)**

b. In a two-dimensional incompressible flow, the fluid velocity components are given by $u = x - 4y$ and $v = -y - 4x$. Show that velocity potential exists and determine its form. Find also the stream function. **(10 Marks)**

OR

4 a. What are the methods of describing fluid flow? Explain briefly. **(04 Marks)**

b. Define the equation of continuity. Obtain an expression for a three-dimensional continuity equation in Cartesian coordinate system. **(08 Marks)**

c. Find the magnitude and direction of the resultant water pressure acting on a curved face of a dam which is shaped according to the relation $y = x^2/9$ as shown in Fig.Q.4(c). The height of the water retained by the dam is 10m. Consider the width of the dam as unity. **(08 Marks)**

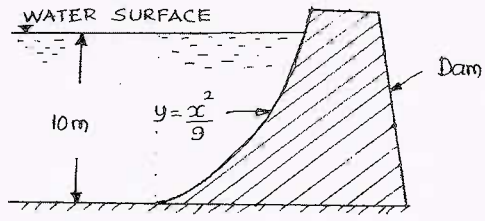

Fig.Q.4(c)

Module-3

5 a. State Bernoulli's theorem. Derive an expression for Bernoulli's theorem from first principle and state the assumptions made for such a derivation. **(10 Marks)**

b. A horizontal venturimeter with inlet diameter 30cm and throat diameter 15cm is used to measure the flow of oil of specific gravity 0.8. The discharge of oil through venturimeter is 50 litres/s, find the reading of the oil-mercury differential manometer. Take $C_d = 0.98$. **(10 Marks)**

OR

6 a. A pipe line carrying oil of specific gravity 0.87, changes in diameter from 200mm diameter at a position A to 500mm diameter at a position B, which is 4 metres at a higher level. If the pressures A and B are 9.81 N/cm^2 and 5.886 N/cm^2 respectively and the discharge is 200 litres/s determine the loss of head and direction of flow. **(10 Marks)**

b. A 45° reducing bend is connected in a pipe line, the diameters at the inlet and outlet of the bend being 40cm and 20cm respectively. Find the force exerted by water on the bend if the intensity of pressure at inlet of bend is 21.58 N/cm^2. The rate of flow of water is 500 litres/s. **(10 Marks)**

Module-4

7 a. Define an orifice and a mouthpiece. What are hydraulic coefficients? Explain them. **(06 Marks)**

b. The head of water over an orifice of diameter 40mm is 10m. Find the actual discharge and actual velocity of the jet at vena-contracta. Take $C_d = 0.6$ and $C_v = 0.98$. **(04 Marks)**

c. Water flows over a rectangular weir 2m wide at a depth of 200mm and afterwards passes through a triangular right-angled weir. Take C_d for the rectangular and triangular weir as 0.63 and 0.59 respectively, find the depth over the triangular weir. **(10 Marks)**

OR

8 a. Derive an expression for the discharge over a triangular notch. **(10 Marks)**

b. The head of water over an orifice of diameter 100mm is 5m. The water coming out from orifice is collected in a circular tank of diameter 2m. The rise of water level in circular tank is 0.45m in 30 seconds. Also the coordinates of a certain point on the jet, measured from vena-contracta are 100cm horizontal and 5.2cm vertical. Find the hydraulic coefficients c_a, c_v and c_c. **(10 Marks)**

Module-5

9 a. Derive Darcy-Weisbach equation for head loss due to friction in a pipe. **(10 Marks)**

b. The rate of flow of water through a horizontal pipe is 0.25 m^3/s. The diameter of the pipe which is 200mm is suddenly enlarged to 400mm. The intensity pressure in smaller pipe is 11.772 N/cm^2. Determine:

i) Loss of head due to sudden enlargement

ii) Pressure intensity in large pipe

iii) Power lost due to enlargement. **(10 Marks)**

OR

10 a. A pipe line of 0.6m diameter is 1.5km long. To increase the discharge, another line of the same diameter is introduced parallel to the first in the second half of the length. Neglecting minor losses, find the increase in discharge if $4f = 0.04$. The head at inlet is 300mm. **(10 Marks)**

b. Explain the phenomenon of water hammer. Obtain an expression for the rise of pressure when the flowing water in a pipe is brought to rest by sudden closure of valve and pipe is elastic. **(10 Marks)**

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17CV34

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
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. Differentiate clearly between plane and geodetic surveying. **(06 Marks)**

b. Discuss in brief the basic principles of surveying. **(06 Marks)**

c. A rectangular plot of land measures 20 cm × 30 cm on a village map drawn to a scale of 100 m to 1 cm. Calculate its area in hectares. If the plot is redrawn on a toposheet to a scale of 1 km to 1 cm, what will be its area on toposheet. Also determine the RF of the scale of village map as well as toposheet. **(08 Marks)**

OR

2 a. Explain: (i) Method of taping on sloping ground (ii) Direct method of ranging. **(08 Marks)**

b. To continue a survey line AB past an obstacle, a line BC 200 meters long was set out perpendicular to AB and from C angles BCD and BCE were set out at 60° and 45° respectively. Determine the lengths which must be chained off along CD and CE in order that ED may be in AB produced. Also, determine the obstructed length BE. **(08 Marks)**

c. A 100 meter tape is suspended between the ends under a pull of 200 N. The weight of the tape is 30 N. Find the correct distance between the tape ends. **(04 Marks)**

Module-2

3 a. Differentiate between: (i) WCB and QB (ii) Prismatic compass and surveyor's compass. **(10 Marks)**

b. The following bearing were observed while running a closed traverse:

LINE	FB	BB
AB	75°5′	254°20′
BC	115°20′	296°35′
CD	165°35′	345°35′
DE	224°50′	44°5′
EA	304°50′	125°5′

Mention the stations which are affected from local attraction and the corrected bearings. **(10 Marks)**

OR

4 a. With the help of tabular column, explain the procedure of measuring horizontal angle by (i) Repetition method (ii) Reiteration method **(14 Marks)**

b. What is spire test? How it is carried? **(06 Marks)**

Module-3

5 a. Explain Bowditch's rule and Transit rule for adjusting a closed traverse. **(10 Marks)**

b. The table below gives the length and bearing of the lines of a traverse ABCDE. Find the length and bearing of EA.

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

(10 Marks)

6 a. Find the expression for distance and elevation when the staff is held vertical and line of sight is inclined. **(10 Marks)**

b. To determine the gradient between two points A and B a tacheometer was set up to another station 'C' and the following observation were made, keeping the staff vertical.

Staff at	Vertical Angle	Staff Reading (m)
A	+4°20′00″	1.300; 1.610; 1.920
B	+0°10′40″	1.100; 1.410; 1.720

If the horizontal angle ACB is 35°20′, determine the average gradient between A and B. K = 100, C = 0. **(10 Marks)**

Module-4

7 a. Define: (i) BS (ii) FS (iii) BM (iv) Elevation. **(04 Marks)**

b. Give the step by step procedure for temporary adjustment of a dumpy level. **(06 Marks)**

c. The following staff readings were observed successively with a level, the instrument having been moved after third, sixth and eight reading: 2.228, 1.606, 0.988, 2.090, 2.864, 1.262, 0.602, 1.982, 1.044, 2.684 metres. Enter the above readings in a page of a level book and calculate the RL of points if the first reading was taken with a staff held on a bench mark of 432.384 m. Use H.I method. **(10 Marks)**

OR

8 a. With a neat sketch explain reciprocal levelling. **(06 Marks)**

b. Explain the following with neat sketches:
(i) Single plane method [instruments are at same level]
(ii) Double plane method. **(14 Marks)**

Module-5

9 a. A series of offsets were taken from a chain line to a curved boundary line at intervals of 15m in the following order. 0, 2.65, 3.80, 3.75, 4.65, 3.60, 4.95, 5.85 m. Compute the area between the chain line, curved boundary and end offsets by trapezoidal and Simpson's rule. **(10 Marks)**

b. A railway embankment is 10 m wide, with a side slope of 1.5 to 1. Assuming the ground to be level in the direction transverse to the central line, calculate the volume contained in a length of 120 m, the centre heights at 20 m intervals being in metres.
2.2, 3.7, 3.8, 4.0, 3.8, 2.8, 2.5
Calculate area for all the centre height. Use (i) Prismoidal formula (ii) Trapezoidal rule. **(10 Marks)**

OR

10 a. From a contour map of reservoir the following contour areas were obtained by the planimeter. The top level of reservoirs is 200 m and bottom level is 180 m. Find the quantity of water intake.

Contour (m)	Area (m^2)
200	3850
195	3450
190	2600
185	800
180	400

Use Trapezoidal rule and prismoidal rule. **(10 Marks)**

b. Discuss the characteristics and uses of contour (five each). **(10 Marks)**

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CBCS SCHEME

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15CV34

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Basic Surveying

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Distinguish between plane surveying and geodetic surveying. **(06 Marks)**

b. Explain the following:
(i) Principle of working from whole to part
(ii) Topo sheets and their numbering **(06 Marks)**

c. Explain different types of errors. **(04 Marks)**

OR

2 a. With a neat sketch, explain step by step procedure for conducting reciprocal leveling. **(06 Marks)**

b. Explain how will you continue chaining past the following obstacles: (i) river (ii) a building. **(06 Marks)**

c. A steel tape of 30 m long was standardized at a temperature of 20°C at a pull of 65N. Find the correction per tape length if the temperature and pull at the time of measurement are 30°C and 100 N. Cross section area of tape = 0.08 cm^2. Modulas of elasticity of steel = 2.1×10^5 N/mm^2, coefficient of thermal expansion = 1.16×10^{-5}/°C **(04 Marks)**

Module-2

3 a. Distinguish between
(i) True meridian and magnetic meridian
(ii) Declination and Dip **(04 Marks)**

b. The following interior angles were measured with a sextant in a closed traverse. The bearing of the line AB was measured as 65°0′ with prismatic compass. Calculate the bearing of all other lines if ∠A = 80°30′; ∠B = 71°30′; ∠C = 100°30′; ∠D = 107°30′. **(06 Marks)**

c. The following bearings were observed while traversing with a compass in clockwise direction.

Line	FB	BB
AB	220°15′	40°15′
BC	150°0′	329°45′
CD	77°30′	256°0′
DE	41°30′	222°45′
EA	314°15′	134°5′

Determine the local attraction and corrected bearing. **(06 Marks)**

OR

4 a. Define the following: Line of collimation, Axis of level tube, Face left observation, Transiting. **(06 Marks)**

b. Briefly explain repetition method of measuring horizontal angles. Give advantages and also state what errors are eliminated by repetition method. **(06 Marks)**

c. What are the desired relationship between fundamental lines of a theodolite? **(04 Marks)**

Module-3

5 a. Distinguish between closed traverse and open transverse. **(06 Marks)**

b. Briefly explain Bowditch's rule and transit rule. **(04 Marks)**

c. Calculate the latitude and departure of a closed traverse from the following details:

Line	Length (m)	WCB
AB	130	92°
BC	158	172°
CD	145	220°
DE	308	279°
EA	337	48°

State weather the traverse needs adjustment or not. **(06 Marks)**

OR

6 a. Briefly explain various types of tacheometry. **(06 Marks)**

b. The following notes refer to a line leveled tacheometrically with an anallactic tacheometer, the multiplying constant being 100:

Inst. Station	Height of axis	Staff stations	Vertical angle	Hair reading
P	1.50	BM	–6°12′	0.963, 1.515, 2.067
P	1.50	Q	+7°5′	0.819, 1.341, 1.863
Q	1.60	R	+12°27′	1.860, 2.445, 3.030

Compute the reduced levels of P.Q and R and the horizontal distance PQ and QR. Given RL of BM = 202.000 **(10 Marks)**

Module-4

7 a. Define level surface, horizontal surface, datum, bench mark. **(04 Marks)**

b. Compare the height of instrument method and rise and fall method of reduction of levels. **(06 Marks)**

c. The following staff readings were observed with a level, the instrument having been moved forward after 3rd and 7th reading.
0.875, 1.245, 2.380, 1.46, 2.885, 3.240, 3.960, 0.120, 1.920
The first reading was taken with the staff held upon a bench mark of elevation 200.00 m. Enter the reading in a page of level book form and calculate the reducing levels of all stations. Apply arithmetic check. **(06 Marks)**

OR

8 a. Explain:
(i) Profile levelling
(ii) Check levelling
(iii) Reciprocal levelling
(iv) Fly levelling **(08 Marks)**

b. Explain the method if determining the distance and elevation of an object using trignomatric leveling. When the bale is inaccessible and the instrument stations are in the same plane as that of the object. Derive the required equations. Assume the station faraway from object is at higher level. **(08 Marks)**

Module-5

9 a. Write a short note on planimeter. **(04 Marks)**

b. The following perpendicular offsets, in meters were taken at 12m intervals from a chain line to an irregular boundary 4.85, 3.86, 7.48, 6.20, 8.08, 9.82, 10.32, 6.82 and 9.46. Calculate the area in sq.m enclosed between the chain line and the irregular boundary using Simpson's rule and trapezoidal rule. **(06 Marks)**

c. The following table gives the corrected latitudes and departures (in meters) of the sides of a closed traverse ABCD.

Line	Latitude	Departure
AB	+84.58	+630.35
BC	−419.94	+95.67
CD	−100.83	−553.03
DA	+436.19	−172.99

Compute the area of traverse. **(06 Marks)**

OR

10 a. Explain the factors affecting contour interval. **(04 Marks)**

b. With the help of neat sketches describe the characteristics of contours (any 3). **(06 Marks)**

c. An embankment of width 10m and side slopes 1½ :1 is required to be made on a ground which is level in a direction transverse to the center line. The central height at 40 m intervals are as follows: 0.90, 1.25, 2.15, 2.50 and 1.85. Compute the amount of earthwork according to prismoidal formula. **(06 Marks)**

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CBCS SCHEME

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15CV42

Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020
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. Define the degree of static and kinematic indeterminacies with examples. **(06 Marks)**

b. Find the forces in the members PQ, PR and RS of the truss shown in Fig.Q.1(b) using method of section. **(10 Marks)**

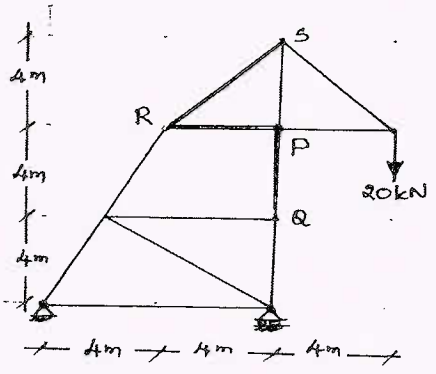

Fig.Q.1(b)

OR

2 a. Determine the Degrees of freedom for the structures shown in Fig.Q.2(a) (i) (ii) and (iii) with and without considering axial deformation. **(06 Marks)**

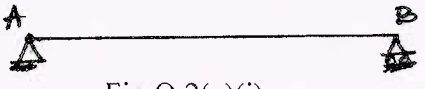

Fig.Q.2(a)(i)

Fig.Q.2(a)(ii)

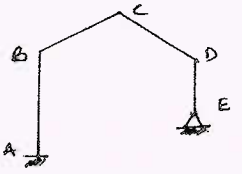

Fig.Q.2(a)(iii)

b. Analyze the truss shown in Fig.Q.2(b) and tabulate the values. **(10 Marks)**

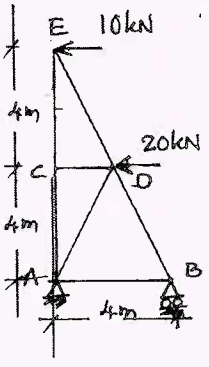

Fig.Q.2(b)

Module-2

3 a. Determine the maximum deflection at the free end of a cantilever beam subjected to udl of w/mt run over its entire span 'L' with constant EI. Use Macaulay's method. **(06 Marks)**

b. For the simply supported beam loaded as shown in Fig.Q.3(b). Find the slope at A and B and deflection at 'E'. Take EI = 4000 kN-m^2. Use moment area method. **(10 Marks)**

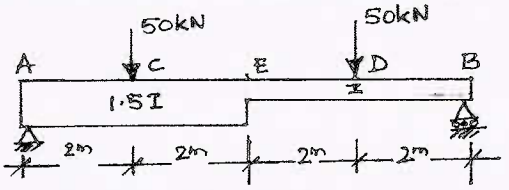

Fig.Q.3(b)

OR

4 a. Derive the differential equation of deflected curve for the beam with usual notations. **(04 Marks)**

b. For the simply supported beam loaded as shown in Fig.Q.4(b). Taking E = 200GPa, I = 7 × 10^{8}mm^4. Find the magnitude and location of Max. deflection in the beam. Use Conjugate Beam Method. **(12 Marks)**

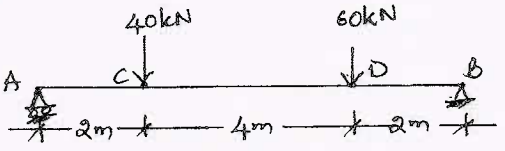

Fig.Q.4(b)

Module-3

5 a. Derive the expression for the strain energy stored in a member due to axial force. **(04 Marks)**

b. Using castigliano's approach find the vertical and horizontal deflection at 'C' of abent loaded as shown in Fig.Q.5(b). Take EI = 15000 kN/m^2. **(12 Marks)**

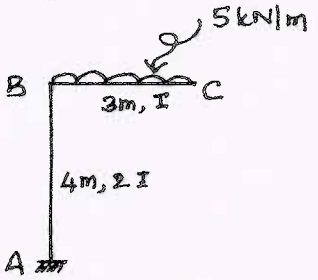

Fig.Q.5(b)

OR

6 a. Determine the horizontal movement at support B of the steel truss loaded as shown in Fig.Q.6(a) by unit load method. Take A = 1000mm^2, E = 200Gpa. **(10 Marks)**

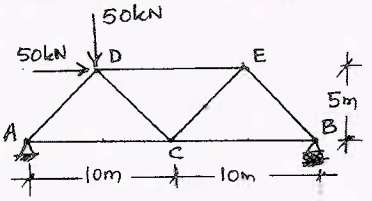

Fig.Q.6(a)

b. Determine the deflection at the mid span of a simply supported beam subjected to a point load 'W' at its mid span using strain energy method. **(06 Marks)**

Module-4

7 a. Show that the bending moment is zero at all sections of a parabolic arch when it is subjected to udl over its entire span. **(06 Marks)**

b. A suspension cable has span of 120m and dips by 10m and carries a load of 10kN/m over its entire span. Find:

i) The length of the cable

ii) Maximum and minimum tension in the cable with its location and direction.

iii) What could be the force transmitted to the supporting tower when the cable passes over a smooth pulley fixed on top of the tower. Assume angle of back stay as 30° to vertical. **(10 Marks)**

OR

8 A three hinged parabolic arch of span 30m has its left and height supports at 12m and 4m below crown point. The arch carries a load of 80kN at distance of 4m to the left of crown C and an udl of 15kN/m between crown and right support. Find the B.M. under the point load, maximum bending moment on the right portion of the arch. Also find normal thrust and radial shear at the point load. **(16 Marks)**

Module-5

9 a. Establish the expression for load position to get maximum bending moment at a section which is at a distance of 'a' from left support 'A' in a simply supported beam AB of span 'L' and traversed by a udl w/mt run which is shorter span. **(06 Marks)**

b. A beam has a span of 20m subjected to two point loads 80kN and 40kN 2m apart rolls from left to right with 40kN load leading. Draw ILD for reaction at B, BM and SF at section 5m from left support, hence find the maximum values of above quantities. **(10 Marks)**

OR

10 a. Wheel loads shown in Fig.Q.10(a) moves from left to right on a S.S. beam of 12m span. Find the absolute maximum BM any where in the beam and also find equivalent udl to be placed over the entire span. **(08 Marks)**

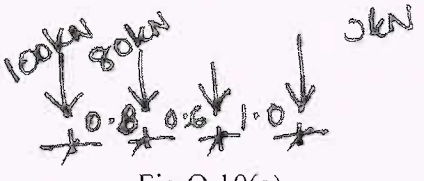

Fig.Q.10(a)

b. Draw the ILD for axial force in member 1 of the truss shown Fig.Q.10(b) and hence find its maximum tensile/ compressive value when a udl of 10kN/m of length traverse from left to right. **(08 Marks)**

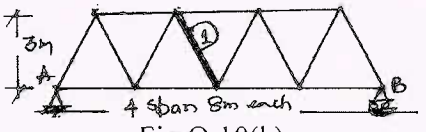

Fig.Q.10(b)

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CBCS SCHEME

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17CV42

Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Analysis of Determinate Structures

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Explain the different types of trusses, with neat sketches. **(04 Marks)**

b. State the assumptions made in the analysis of truss. **(04 Marks)**

c. Find the forces in all members of the pin jointed truss shown in Fig.Q1(c) by method of joints.

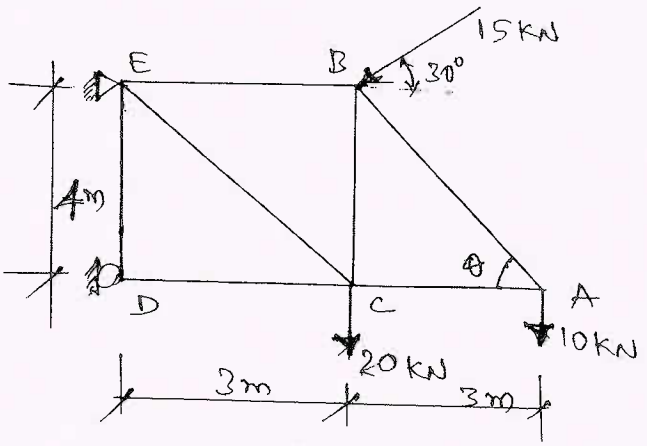

Fig.Q1(c) **(12 Marks)**

OR

2 a. Differentiate between statically determinate and indeterminate structures. **(04 Marks)**

b. Explain linear and non linear systems. **(04 Marks)**

c. Find the forces in the members EB, EC and DC by method of sections shown in Fig.Q2(c).

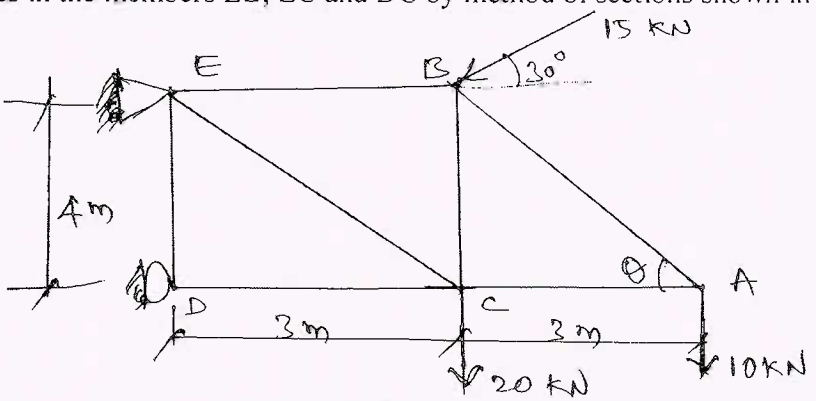

Fig.Q2(c) **(12 Marks)**

Module-2

3 a. State the first and second moment area theorems. **(04 Marks)**

b. Derive the Moment Curvature Equation for deflection. **(06 Marks)**

c. Determine slope and deflection for the simply supported beam subjected to point load at mid span shown in Fig.Q3(c).

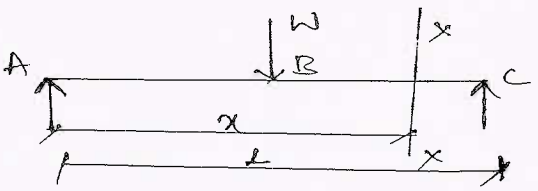

Fig.Q3(c) **(10 Marks)**

OR

4 a. Find the maximum slope and deflection at free end for the loaded beam shown in Fig.Q4(a) by Moment Area method.

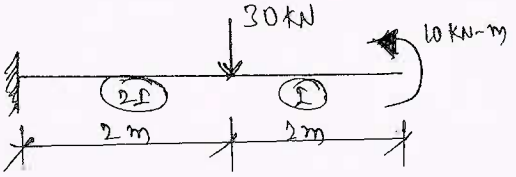

Fig.Q4(a) **(10 Marks)**

b. Determine the slope and deflection of the cantilever beam shown in Fig.Q4(b), using conjugate beam method.

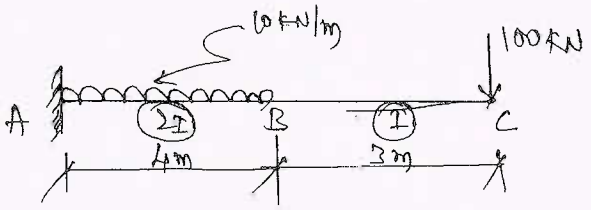

Fig.Q4(b) **(10 Marks)**

Module-3

5 a. Derive the expression for strain energy stored in an prismatic element subjected to pure bending moment. **(08 Marks)**

b. Determine the deflection at the center of the loaded simply supported beam as shown in Fig.Q5(b) by Castiglion's theorem.

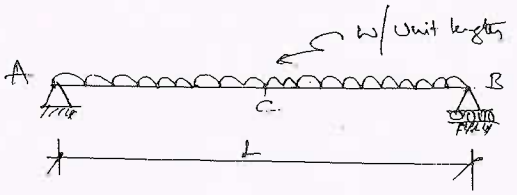

Fig.Q5(b) **(12 Marks)**

OR

6 a. Determine the horizontal displacement of the roller support end A of the frame shown in Fig.Q6(a), take EI = 8000 kN-m^2 by unit load method.

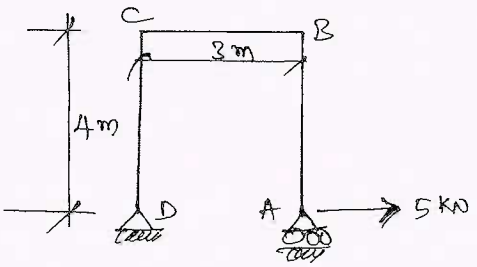

Fig.Q6(a) **(10 Marks)**

b. Determine the deflection at the load point for the beam shown in Fig.Q6(b) by using strain energy method.

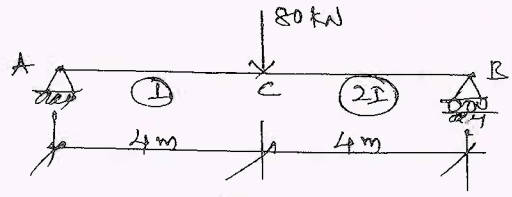

Fig.Q6(b) **(10 Marks)**

Module-4

7 a. Show that $L_C = L + \frac{8h^2}{3L}$ for a cable of span L and UDL of intensity W kN-m. **(08 Marks)**

b. A three hinged parabolic arch of span 24 m rise 6 m with hinged at abutments and at crown point. Arch subjected to a point loads of 50 kN and 150 kN at a distance of 8m and 20 m from left supports, determine, reactions at supports, radial shear and normal thrust at a distance of 6m both from left and right support and draw Bending Moment Diagram. **(12 Marks)**

OR

8 a. A cable of 20 m and dip 4m carries a UDL of 20 kN-m over the whole span, find the maximum tension in the cable and length of the cable. **(08 Marks)**

b. A three hinged parabolic arch is having a span of 36 m. It is subjected to UDL 30 kN/m from left support hinge to crown hinge. Determine the normal thrust, radial shear and bending moment at quarter span point located from left support. **(12 Marks)**

Module-5

9 a. What are the uses of influence line diagram? **(04 Marks)**

b. Draw the influence line diagram for shear force at a section for a simply supported beam subjected to single point load. **(06 Marks)**

c. Find the shear force at the section G for the loaded simply supported beam by using influence line diagram. Also find shear forces. [Refer Fig.Q9(c)]

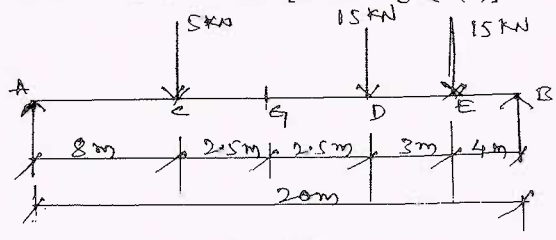

Fig.Q9(c) **(10 Marks)**

OR

10 a. Explain the procedure for generating influence line diagrams. **(04 Marks)**

b. Determine the influence line diagram for the forces in the members U_1U_2 U_2U_3 L_2L_3 U_2L_2 and U_2L_3 for the part truss as shown in Fig.Q10(b).

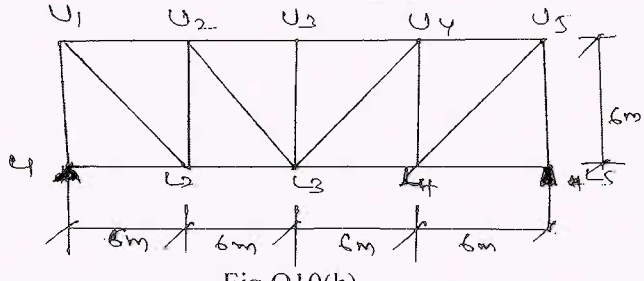

Fig.Q10(b) **(16 Marks)**

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CBCS SCHEME

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17CV43

Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020
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 the terms: (i) Model (ii) Prototype (iii) Model analysis (iv) Hydraulic similitude **(06 Marks)**

b. In 1 in 40 model of spillway the velocity and discharge are 2m/s and 2.5 m^3/s. Find the corresponding velocity and discharge in the prototype. **(04 Marks)**

c. Using Buckingham's π - theorem, derive the following relationship $R = \rho V^2 D^2 \phi\left(\frac{\mu}{\rho VD}, \frac{H}{D}\right)$

where R = resistance, ρ = density, V = velocity of flow, D = diameter, μ = viscosity and H = height. **(10 Marks)**

OR

2 a. Explain the types of similarities in model analysis. **(06 Marks)**

b. A pipe of diameter 1.8 m is required to transport an oil of specific gravity 0.8 and viscosity 0.04 poise at the rate of 4 m^3/s. Tests were conducted on a 20 cm diameter pipe using water at 20°C. Find the velocity and rate of flow in model, viscosity of water at 20°C is 0.01 poise. **(08 Marks)**

c. Explain the experimental method of determination of meta-centric height. **(06 Marks)**

Module-2

3 a. Distinguish between pipe flow and open channel flow. **(04 Marks)**

b. Derive Chezy's equation for uniform flow in open channel with usual notations. **(08 Marks)**

c. A trapezoidal channel with side slopes 3H:2V has to be designed to carry 10 m^3/s at velocity of 1.5 m/s, so that the amount of concrete lining for the bed and sides is minimum. Find: (i) The wetted perimeter (ii) Slope of bed if Manning's N = 0.014 **(08 Marks)**

OR

4 a. For most economical trapezoidal section show that half of the top width is equal to one of the side slope length. **(06 Marks)**

b. Explain with neat sketch the specific energy curve. **(06 Marks)**

c. A discharge of 18 m^3/s flows through a rectangular channel 6m wide at a depth of 1.6 m. Find: (i) specific energy (ii) critical depth (iii) critical velocity (iv) value of minimum specific energy. **(08 Marks)**

Module-3

5 a. Define the term hydraulic jump. Derive an expression for a hydraulic jump in a horizontal rectangular channel. **(10 Marks)**

b. Find the slope of the free water surface in a rectangular channel of width 20 m having depth of flow 5m. The discharge through the channel is 50 m^3/s. The bed of the channel is having a slope of 1 in 4000. Take the value of Chezy's constant C = 60. **(10 Marks)**

OR

6 a. Explain the following slope profiler, (i) Critical slope (ii) Mild slope (iii) Steep slope and also draw profile of M_1, M_2 and M_3. **(10 Marks)**

b. A sluice gate discharges water into a horizontal channel with a velocity of 5m/s and depth of flow is 0.4 m. The width of the channel is 6m. Determine whether a hydraulic jump will occur, and if so find its height and loss of energy per kg of water. Also determine the power lost in the hydraulic jump. **(10 Marks)**

Module-4

7 a. Find an expression for the efficiency of a series of moving curved vanes when a jet of water strokes the vanes at one of the tips. Prove that maximum efficiency is 50% when $u > v$. **(10 Marks)**

b. A pelton wheel has to develop 13200 KW under a net head of 820 m while running at a speed of 600 rpm. If the coefficient of jet $C_V = 0.98$, speed ratio $\phi = 0.46$ and jet diameter is $\frac{1}{16}$ of wheel diameter, calculate (i) pitch circle diameter (ii) the diameter of the jet (iii) quantity of water supplied to the wheel (iv) Number of jets required. Assume overall efficiency as 85%. **(10 Marks)**

OR

8 a. Draw a neat sketch of a layout of hydroelectric power plant and explain the functions of each component. Also define different heads. **(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 the direction of vanes when entering and leaves at an angle of 120°. Draw the triangles of velocities at inlet and outlet and find,

(i) The angles of vanes tips so that water enters and leaves without shock.

(ii) The work done per unit weight of water entering the vanes

(iii) Efficiency. **(10 Marks)**

Module-5

9 a. What is a draft tube? What are the functions of draft tube? **(04 Marks)**

b. Derive the expression for minimum starting speed of a centrifugal pump. **(06 Marks)**

c. A Kaplan turbine develops 24647.6 KW power at an average head of 39 m. Assuming the speed ratio of 2, flow ratio of 0.6, diameter of boss equals to 0.35 times the diameter of runner and an overall efficiency of 90%, calculate the diameter, speed and specific speed of the turbine. **(10 Marks)**

OR

10 a. Explain manometric efficiency, mechanical efficiency and overall efficiency of a centrifugal pump. **(06 Marks)**

b. Define unit head, unit discharge and unit power. **(04 Marks)**

c. A centrifugal pump is to deliver 0.12 m^3/s at a speed of 1450 rpm against a head of 25 m. The impeller diameter is 250 mm, width at outlet is 50 mm. The manometric efficiency is 75%. Determine the vane angles at the outer periphery of the impeller. **(10 Marks)**

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CBCS SCHEME

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17CV/CT44

Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Concrete Technology

Time: 3 hrs. Max. Marks: 100

Note: 1. *Answer any FIVE full questions, choosing ONE full question from each module.*
2. *IS – 10262 mix design code is allowed.*

Module-1

1 a. Explain the manufacturing process of cement by wet process using flow chart. **(10 Marks)**
b. Name chemical and mineral admixtures and explain flyash and Metakaolin admixtures in detail. **(10 Marks)**

OR

2 a. Define Hydrating Cement. With schematic representation, explain structure of hydrated cement paste. **(08 Marks)**
b. Name the alternatives of River sand and explain the properties of M – Sand. **(06 Marks)**
c. Explain the importance of Aggregate in concrete. **(06 Marks)**

Module-2

3 a. Explain two laboratory tests for measurement of workability. **(10 Marks)**
b. Explain the manufacturing process of concrete. **(10 Marks)**

OR

4 a. Explain the methods of curing. **(10 Marks)**
b. Describe the effect of heat of hydration during mass concerting at project sites. **(05 Marks)**
c. Explain Segregation and Bleeding. **(05 Marks)**

Module-3

5 a. Explain the factors influence the strength of Hardened concrete. **(06 Marks)**
b. What are the factors which affects the creep? **(04 Marks)**
c. Explain the types of Shrinkage in concrete. **(10 Marks)**

OR

6 a. What are the Internal and External factors influence the durability of concrete? **(12 Marks)**
b. Briefly explain the Rebound hammer test and Ultrasonic pulse velocity test. **(08 Marks)**

Module-4

7 a. Explain the concept of mix design. **(06 Marks)**
b. List out the data required for mix proportioning. **(04 Marks)**
c. Write the steps involved in the methods of mix design. **(10 Marks)**

OR

8 Design a concrete mix for M_{35} grade using fly ash. Other data are given below :

a.	Type of cement	OPC 43 grade
b.	Type of flyash	F type
c.	Maximum size of aggregate	20 mm
d.	Minimum cement content	320kg/m^3
e.	Maximum water cement ratio	0.45
f.	Workability	100 mm slump
g.	Exposure condition	Severe (RCC)
h.	Method of placing concrete	Pumping
i.	Degree of supervision	good
j.	Chemical admixture	Super plasticizer
k.	Specific gravity of cement	3.15
l.	Specific gravity of fly ash	2.2
m.	Specific gravity of coarse aggregate	2.78
n.	Specific gravity of fine aggregate	2.70
o.	Water absorption :	
	i) Coarse aggregate	0.5%
	ii) Fine aggregate	Nil
p.	Free surface moisture	
	i) Coarse aggregate	Nil
	ii) Fine aggregate	1.5%

q. Grading of coarse aggregate is confirming to table 2 of IS 383 and grading of fine aggregate is falling Zone I. **(20 Marks)**

Module-5

9 a. Explain the production of Ready Mixed concrete. **(12 Marks)**

b. What is Self Compacting Concrete? Explain the materials required for self compacting concrete used. **(08 Marks)**

OR

10 a. Explain the types of fibres used in Fiber Reinforced Concrete and its application. **(10 Marks)**

b. Explain properties of light weight concrete. **(04 Marks)**

c. List out advantages of Light weight concrete. **(06 Marks)**

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CBCS SCHEME

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17CV45

Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Basic Geotechnical Engineering

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. With the help of 3-phase diagram define: void ratio, porosity, water content and degree of saturation. **(08 Marks)**

b. Derive from first principles, the following phase relation:

$$\gamma_d = \frac{(1-n_a)G.\gamma_w}{1+WG}$$ **(06 Marks)**

c. With the help of particle size distribution curve explain: well graded soil, uniformly graded soil and gap graded soil. **(06 Marks)**

OR

2 a. With a neat sketch, explain the salient features of a plasticity chart. **(08 Marks)**

b. The natural dry density of a soil deposit was found to be 17.5kN/m^3. A sample of soil was brought to the laboratory and the minimum and maximum dry densities were found as 16kN/m^3 and 19kN/m^3 respectively. Calculate the density index for the soil deposit. **(06 Marks)**

c. How many cubic meters of soil can be formed with a void ratio of 0.5 from 100 cubic meters of soil having void ratio of 0.7. **(06 Marks)**

Module-2

3 a. List and explain various soil structures. **(06 Marks)**

b. What is the effect of compaction on soil properties? **(06 Marks)**

c. Following are the results of a standard proctor compaction test on a soil:

Water content, %	8.5	12.2	13.75	15.5	18.20
Weight of wet soil in kgs	1.8	1.94	2.0	2.04	2.03

Plot the compaction curve and get maximum dry density and OMC. Also plot ZAV line. Take G = 2.75 and volume of mould as 995 c.c. **(08 Marks)**

OR

4 a. Describe the three principal clay minerals. **(08 Marks)**

b. Explain electrical diffuse double layer and adsorbed water. **(06 Marks)**

c. What are the factors which affect compaction? **(06 Marks)**

Module-3

5 a. Derive an expression to obtain coefficient of permeability under falling head condition. **(06 Marks)**

b. Explain with a neat sketch the method of locating the phreatic line in a homogeneous earth dam with horizontal filter. **(06 Marks)**

c. Calculate the coefficient of permeability of a soil sample, 6 cms in height and 50cm^2 in cross-sectional area, if a quantity of water equal to 430ml passed down in 10 minutes, under an effective constant head of 40cms. On oven drying the test specimen has a mass of 498 gms. Taking the specific gravity of soil solids as 2.65, calculate the seepage velocity of water during the test. **(08 Marks)**

OR

6 a. State the characteristics and uses of flownets. **(08 Marks)**

b. Explain the terms superficial velocity and seepage velocity. Derive the relationship between them. **(06 Marks)**

c. If during a variable head permeability test on a soil sample, equal time intervals are noted for drops of head from h_1 to h_2 and again from h_2 to h_3. Find the relationship between h_1, h_2 and h_3. **(06 Marks)**

Module-4

7 a. Explain mass-spring analogy of consolidation of soils. **(06 Marks)**

b. Explain Casagrande's method of determination of pre consolidation pressure. **(06 Marks)**

c. The time to reach 40% consolidation of a two way drained saturated clay sample of 10mm thick in the laboratory is 40 secs. Determine the time required for 60% consolidation of the same soil 12m thick on an impervious layer subjected to same loading conditions. **(08 Marks)**

OR

8 a. Explain square root of time fitting method for determination of coefficient of consolidation. **(06 Marks)**

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

c. A layer of clay 8m thick underlies a proposed new building. The existing overburden pressure at the centre of clay layer is 290kN/m^2 and the load due to new building increases the pressure by 100kN/m^2. C_C = 0.45, W = 50%, G = 2.71. Estimate consolidation settlement. **(08 Marks)**

Module-5

9 a. Explain Mohr-Coulomb theory of shear strength. **(06 Marks)**

b. Explain the advantages and disadvantages of direct shear test over triaxial shear test. **(06 Marks)**

c. An unconfined compression test was conducted on an undisturbed sample of clay. The sample had a diameter of 38mm and was 80mm long. The load at failure measured as 30N and the axial deformation of the sample of failure was 12mm. Determine the unconfined compressive strength and undrained shear strength of clay. **(08 Marks)**

OR

10 a. Explain sensitivity and thixotropy. **(06 Marks)**

b. Explain vane shear test with a neat sketch. **(06 Marks)**

c. The triaxial tests carried out on soil samples gave the following results:

Confining pressure, kN/m^2	50	100	150
Deviator stress, kN/m^2	76	132	186
Pore water pressure, kN/m^2	35	59	83

Plot Mohr's circle and obtain effective shear parameters. **(08 Marks)**

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CBCS SCHEME

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17CV46

Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020
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. What is the relation between the degree of a curve and its radius? **(06 Marks)**

b. What are the requirements of an essential transition curve? **(06 Marks)**

c. A reverse curve AB is to be set out between two parallel railway tangents 32m apart. If the two arcs of the curve are to have same radius and the distance between tangents A and B is 160m, calculate the radius. The curve is to be setout from AB at 10m intervals along that line. Calculate the length of offsets. **(08 Marks)**

OR

2 a. Explain how a simple circular curve is setout by perpendicular offsets from long chord. **(06 Marks)**

b. Explain the features of vertical curves. **(04 Marks)**

c. Two straights AC and CB are intersected by a third line MN such that $\angle CMN = 45^\circ 30'$ and $\angle CNM = 35^\circ 30'$ and the distance MN = 320m. Find the radius of the curve which will be tangential to the three lines AC, MN and CB. If the chainage of the intersection point C is 4875.50m, calculate the chainages of the point of curve A and the point of tangency B. **(10 Marks)**

Module-2

3 a. Explain first order, second order and third order triangulation systems. **(06 Marks)**

b. Explain the three kinds of errors. **(06 Marks)**

c. From a satellite station S, 5.8m from main triangulation station A, the following directions were observed:

A	0°	0′	0″
B	132°	18′	30″
C	232°	24′	6″
D	296°	6′	11″

The lengths of AB, AC and AD were computed to be 3265.5m, 4022.2m and 3086.4m respectively. Determine the directions of AB, AC and AD. **(08 Marks)**

OR

4 a. What are the important factors to be considered in selection of site for a base line? **(06 Marks)**

b. Explain Satellite stations and reduction to centre. **(06 Marks)**

c. Find the most probable values of the angles A and B from the following observations at a station 0. **(08 Marks)**

A = 9°	48′ 36.6″	Weight 2
B = 54°	37′ 48.3″	Weight 3
A + B = 104°	26′ 28.5″	Weight 4

Module-3

5 a. Define the terms, celestial sphere, prime vertical and hour angle. **(06 Marks)**

b. Explain the solution of spherical triangle by Napiers rule. **(06 Marks)**

c. Determine the azimuth and altitude of a star from the following data:
Declination of star = 20° 30′ N
Hour angle of star = 42° 6′
Latitude of observer = 50°N **(08 Marks)**

OR

6 a. Mention the properties of a spherical triangle. **(06 Marks)**

b. Calculate the distance in kilometers between two pint A and B along the parallel of latitude, given that:
i) Lat. of A, 28° 42′ N; longitude of A, 31° 12′ W
Lat. of B, 28° 42′ N; longitude of B, 47° 24′ W
ii) Lat. of A 12° 36′ S; longitude of A, 115° 6′ W
Lat. of B 12° 36′ S; longitude of B, 150° 24′ E. **(08 Marks)**

c. The standard time meridian in India is 82° 30′ E. If the standard time at any instant is 20hours, 24 min, 6 secs, find the local mean time for a place having 20°E longitude. **(06 Marks)**

Module-4

7 a. Define: vertical photograph, tilted photograph and oblique photograph. **(06 Marks)**

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

c. A section line AB appears to be 10.16 cms on a photograph for which the focal length is 16cms. The corresponding line measures 2.54 cms on a map which is to a scale of 1:50000. The terrain has an average elevation of 200m above mean sea level. Calculate the flying altitude of the aircraft, above mean sea level when the photograph was taken. **(08 Marks)**

OR

8 a. Define: Perspective projection, Nadir point and tilt. **(06 Marks)**

b. List the reasons for keeping overlap in photographs. **(06 Marks)**

c. What is relief displacement? Derive its expression. **(08 Marks)**

Module-5

9 a. Mention the advantages of total station and describe its working principle. **(10 Marks)**

b. What is GIS? Mention its applications to Civil Engineering. **(10 Marks)**

OR

10 a. Explain the working principle of GPS. What are the differences between hand held GPS and differential GPS? **(10 Marks)**

b. What are the advantages of LIDAR technology? **(10 Marks)**

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CBCS SCHEME

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15CV43

Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Applied Hydraulics

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Explain dimensional homogeneity with examples. **(05 Marks)**

b. State Buckingham's π-theorem and also describe Buckingham's π-theorem. **(05 Marks)**

c. Find the expression for the power P, developed by a pump when P depends upon the head H, the discharge Q and specific weight 'W' of the fluid. **(06 Marks)**

OR

2 a. What are the types of similarities to be established for complete similarity to exist between the model and its prototype? **(06 Marks)**

b. A 1:64 model is constructed of an open channel in concrete which has Manning's N = 0.014. Find the value of N for the model. **(05 Marks)**

c. Explain the term: Buoyancy, force and centre of Buoyancy and meta centre. **(05 Marks)**

Module-2

3 a. Discuss the various types of flow through channels. **(05 Marks)**

b. Derive Manning's equation for flow through open channel. **(05 Marks)**

c. An earthen channel with a base width 2m and side slope 1 horizontal to 2 vertical carries water with a depth of 1m. The bed slope is 1 in 625. Calculate the discharge if mannings roughness is 0.03. Also calculate the average shear stress at the channel boundary. **(06 Marks)**

OR

4 a. Explain with a neat sketch of specific energy curve. Also derive an expression for critical depth, critical velocity and minimum specific energy. **(10 Marks)**

b. A rectangular channel which is laid on a bottom slope of 0.0064 is to carry 20 m^3/s of water. Determine the width of the channel when the flow is in critical condition. Take Manning's coefficient = 0.015. **(06 Marks)**

Module-3

5 a. Derive an expression for depth of hydraulic jump in terms of upstream Froude number. **(08 Marks)**

b. The depth of flow of water, at a certain section of a rectangular channel of 2m wide, is 0.3m. The discharge through the channel is $1.5m^3/s$. Determine whether a hydraulic pump will occur, and if so, find its height and loss of energy per Newton of water. **(08 Marks)**

OR

6 a. Derive GVF equation in the form $\frac{dh}{dx} = \frac{i_b - i_e}{(1 - Fr^2)}$, where $\frac{dh}{dx}$ = slope of free surface, i_b = bed slope, i_e = energy line slope, h = depth of flow and v = velocity of flow. State the assumptions made. **(09 Marks)**

b. Find the free surface slope in a rectangular channel of width 20m, having depth of flow 5m. The discharge through the channels is $50m^3/s$. The longitudinal bed slope is 1 in 4000. Take C = 60. **(07 Marks)**

Module-4

7 a. Derive an expression for force exerted by a jet strikes the moving curved vane at the centre and also work done by the jet. **(09 Marks)**

b. A jet of water of diameter 75mm strikes a curved vane at its centre with a velocity of 20m/s. The curved vane is moving with a velocity of 8m/s in the direction of the jet. The jet is deflected through an angle of 165°. Assume the plate is smooth. Find: i) Force exerted on the plate in the direction of jet, ii) Power of the jet and iii) Efficiency of the jet. **(07 Marks)**

OR

8 a. Explain with a sketch the general layout of a hydro-electric power plant. **(05 Marks)**

b. Discuss the classification of turbines. **(05 Marks)**

c. Determine the power given by the jet of water to the runner of a Pelton wheel which is having tangential velocity as 20m/s. The net head at the turbine is 50m and discharge through the jet of water is 0.03 m^3/s. The side clearance angle is 15° and $C_v = 0.98$. **(06 Marks)**

Module-5

9 a. With a neat sketch explain working principle of Kaplan turbine and also mention the main components. **(08 Marks)**

b. A Kaplan turbine develops 24647.60kW power at an average head of 39m. Assuming the speed ratio of 2, flow ratio of 0.6, diameter of the bars equal to 0.35 times the diameter of the runner and an overall efficiency of 90%, calculate the diameter, speed and specific speed of the turbine. **(08 Marks)**

OR

10 a. Obtain an expression for the work done by impeller of a centrifugal pump on water per second per unit weight of water. **(06 Marks)**

b. Define the terms: suction head, delivery head, static head and manometric head. **(04 Marks)**

c. A centrifugal pump is to be discharge $0.118m^3/s$ at a speed of 1450 rpm against head of 25m. The impeller diameter is 250mm, its width at outlet is 50mm and manometric efficiency is 75%. Determine the vane angle at the outer periphery of the impeller. **(06 Marks)**

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CBCS SCHEME

USN | | | | | | | | | | |

15CV45

Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Basic Geotechnical Engineering

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Define : Void ratio , Porosity , Degree of saturation and Air content. **(04 Marks)**

b. Derive the expression for dry density of soil in the form

$$\gamma_d = \frac{(1 - n_a)G.\gamma_w}{1 + wG}$$ with usual notations. **(06 Marks)**

c. Define Liquid limit , Relative consistency and Toughness index. **(06 Marks)**

OR

2 a. State Stoke's law. List the assumptions **(04 Marks)**

b. Explain with the help of particle size distribution curves : Well graded soil , Poorly graded soil and Gap graded soil. **(06 Marks)**

c. A fully saturated soil sample has a water content of 35% and specific gravity of 2.65. Determine its porosity , saturated unit weight and dry unit weight. **(06 Marks)**

Module-2

3 a. What are the different types of clay minerals commonly found in soils? Explain any one with their structure. **(06 Marks)**

b. The observations of a standard proctor test are as follows :

Dry density , KN/m^3	16.16	17.06	18.61	18.95	18.78	17.13
Water content , %	5	8.81	11.25	13.05	14.40	19.25

i) Plot the compaction curve and determine OMC and $\gamma_{d\,max}$.

ii) Also compute void ratio and degree of saturation at optimum condition. Take G = 2.77. **(10 Marks)**

OR

4 a. Differentiate between Standard and Modified Proctor's tests. **(04 Marks)**

b. Discuss the effect of compaction on different properties of soil. **(06 Marks)**

c. Explain Electrical diffuse double layer and Adsorbed water. **(06 Marks)**

Module-3

5 a. Differentiate between : i) Seepage velocity and discharge velocity

ii) Coefficient of permeability and coefficient of percolation. **(04 Marks)**

b. Derive an expression for the determination of coefficient of permeability by falling head permeameter. **(06 Marks)**

c. An earthen dam 300m long is built on an impervious foundation with a horizontal filter under the d/s slope. The horizontal and vertical permeability's of the soil are 5×10^{-5} m/sec and 2×10^{-5} m/sec respectively. The full reservoir level is 20m above the downstream filter. The flow net consists of 4 flow channels and 16 equipotential drops. Estimate the seepage loss in litres per day per unit length of the dam. **(06 Marks)**

OR

6 a. What is a Flownet? Briefly explain the characteristics and uses of flownets. **(08 Marks)**

b. A clay structure of thickness 8m is located at a depth of 6m below the ground surface, it is overlayed by fine sand, the water table is located at a depth of 2m below ground surface. For fine sand submerged unit weight is 10.2 kN/m^3. The moist unit weight of sand located above water table is 16kN/m^3. For clay layer G = 2.76 and w = 25%. Compute the effective stress at the middle of clay layer. **(08 Marks)**

Module-4

7 a. What are Curve fitting methods used in consolidation test? Explain anyone with a neat sketch. **(08 Marks)**

b. A bed of compressible clay, 4m thick has pervious sand at top and an impervious rock at the bottom. In a consolidation test on an undisturbed sample of clay from this deposit, 90% settlement was reached in 4 hours. The sample was 20mm thick. Estimate the time in years for the building founded over this deposit to reach 90% of its final settlement. **(08 Marks)**

OR

8 a. Differentiate compaction from consolidation. **(04 Marks)**

b. Define the terms : Coefficient of compressibility , Coefficient of consolidation and Compression index. **(06 Marks)**

c. Explain the significance of preconsolidation pressure. Describe Casagrande's method of determining it. **(06 Marks)**

Module-5

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

b. Explain Sensitivity and Thixotropy of clay. **(06 Marks)**

c. A shear vane of 75mm diameter and 110mm length was used to measure the shear strength of a soft clay. If a torque of 600 N-m was required to shear the soil, calculate the shear strength. The vane was then rotated rapidly to cause remoulding of the soil. The torque required in the remoulded state was 200 N-m. Determine the sensitivity of the soil. **(06 Marks)**

OR

10 a. What are the advantages and disadvantages of direct shear test over triaxial test? **(08 Marks)**

b. A direct shear test was carried out on a cohesive soil sample and the following results were obtained :

Normal stress, kN/m^2	150	250
Shear stress at failure kN/m^2	110	120

What would be the deviator stress at failure, if a triaxial test is carried out on the same soil with a cell pressure of 150kN/m^2. **(08 Marks)**

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CBCS SCHEME

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18CV32

Third Semester B.E. Degree Examination, Aug./Sept.2020
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. Sketch a typical stress-strain curve for a ductile material and explain briefly the salient features of the curve. **(05 Marks)**

b. Derive an expression for the deformation of a rectangular tapering bar of uniform thickness. **(05 Marks)**

c. Determine the value of P that will not except a maximum deformation of 2mm or a stress of 120 MPa in steel, 80 MPa in Aluminium and 115 MPa in bronze (Fig.Q1(c)). Given the following data:

$A_b = 600\ mm^2$, $E_b = 0.84\times10^5\ N/mm^2$

$A_a = 800\ mm^2$, $E_a = 0.7\times10^5\ N/mm^2$

$A_s = 400\ mm^2$, $E_s = 2.1\times10^5\ N/mm^2$

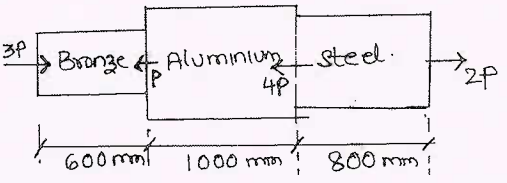

Fig.Q1(c) **(10 Marks)**

OR

2 a. Derive the relationship between Young's modulus and bulk modulus. **(05 Marks)**

b. A load of 270 kN is acting on a RCC column of size 200mm × 200mm. The column is reinforced with 10 bars of 12mm diameter each. Determine the stress in steel and concrete. $E_s = 16.5\ E_c$. **(05 Marks)**

c. A bar of brass 25mm diameter is enclosed in a steel tube of 50mm external diameter and 25mm internal diameter. The bar and tube are both initially 1m long and rigidly fastened at both the ends. Find the stresses in the two materials when the temperature rises from 10°C to 90°C.

If the composite bar is then subjected to an axial tensile load of 60 kN, find the resulting stresses given that : $E_s = 200\times10^3$ MPa, $E_b = 100\times10^3$ MPa, $\alpha_s = 11.6\times10^{-6}/°C$, $\alpha_b = 18.7\times10^{-6}/°C$. **(10 Marks)**

Module-2

3 a. Explain the maximum shear stress theory. **(05 Marks)**

b. Explain the procedure for determining stresses in a general two dimensional stress system using Mohr's circle. **(05 Marks)**

c. At a point in a strained material, the state of stresses is as shown in Fig.Q3(c), Determine the principal stresses, maximum shear stress and sketch the orientation of the principal planes.

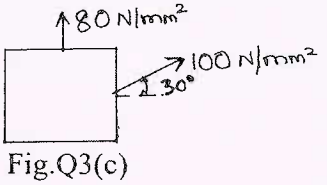

Fig.Q3(c) **(10 Marks)**

OR

4 a. In a thin cylinder, show that he hoop stress is twice the longitudinal stress. **(08 Marks)**

b. The maximum stress permitted in a thick cylinder of internal diameter 100mm and external diameter 150mm is 16 N/mm^2. If the internal pressure is 12 N/mm^2, what external pressure can be applied? Plot curves showing the variation of Hoop stress and radial stress through the material. **(12 Marks)**

Module-3

5 a. Define the terms:
(i) Bending Moment (ii) Point of Inflexion. **(04 Marks)**

b. Draw SFD and BMD for the cantilever beam shown in Fig.Q5(b).

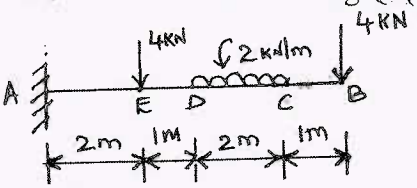

Fig.Q5(b) **(06 Marks)**

c. Draw SFD and BMD for a simply supported beam carrying two point loads of 12 kN at 1/3rd span from either supports in addition to a UDL of 10 kN/m throughout span of beam is 6m. **(10 Marks)**

OR

6 a. Establish the relationship between shear force, bending moment and load intensity. **(06 Marks)**

b. Draw SFD and BMD for the beam shown in Fig.Q6(b). Locate maximum shear force maximum bending moment and point of contraflexure.

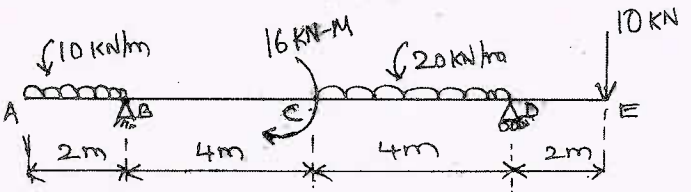

Fig.Q6(b) **(14 Marks)**

Module-4

7 a. Derive the simple bending equation in the form $\frac{M}{I} = \frac{f}{y} = \frac{E}{R}$ with usual notations. **(08 Marks)**

b. A beam of I section consists of 180mm × 15mm flanges and a web of 280mm × 15mm. It is subjected to a bending moment of 120 kN-m and a shear force of 60 kN. Sketch the bending stress distribution and shear stress distribution along the depth of the section. **(12 Marks)**

OR

8 a. Derive the torsion equation for a circular shaft subjected to pure torsion. **(10 Marks)**

b. A solid shaft of 60mm diameter is to be replaced by a hollow shaft of same length. The outer diameter of hollow shaft is same as that of solid shaft. If the angle of twist per unit torsional moment is the same in both cases, determine the inner diameter of hollow shaft. Take the modulus of rigidity of hollow shaft to be three times that of solid shaft. **(10 Marks)**

Module-5

9 a. Derive an expression for the slope and deflection of a simply supported beam carrying a central concentrated load. **(08 Marks)**

b. A simply supported beam of constant cross section is 10m long. It is loaded with two point loads of 100 kN and 80 kN at points 2m and 6m from the left end respectively. Calculate the deflection under each load the maximum deflection. Take E = 200 GPa and I = 18×10^8 mm^4. **(12 Marks)**

OR

10 a. Distinguish between long and short columns. **(04 Marks)**

b. What are the limitations of Euler's column theory? **(04 Marks)**

c. A hollow cast iron column whose outside diameter is 200mm has a thickness of 20mm. It is 4.5m long and fixed at both ends. Calculate (i) Slenderness ratio (ii) Ratio of Euler's and Rankine's critical loads. Take E = 100 GPa, $\alpha = \frac{1}{1600}$ and σ_c = 550 N/mm^2. **(12 Marks)**

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CBCS SCHEME

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18CV33

Third Semester B.E. Degree Examination, Aug./Sept.2020
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 with symbols. Dynamic Viscosity, kinematic viscosity, surface tension. **(06 Marks)**

b. Derive the expression for pressure intensity inside a soap bubble. **(06 Marks)**

c. If 10,000 liters of certain liquid weigh 1329kN. Calculate:
i) Specific weight ii) Mass density iii) Specific volume and iv) Specific gravity. **(08 Marks)**

OR

2 a. Define gauge pressure, absolute pressure and atmospheric pressure and give the relation between them. **(08 Marks)**

b. What is the difference between U-tube differential manometer and inverted U-tube differential manometer? Where are they used? **(04 Marks)**

c. An U tube differential manometer connects two pressure pipes A and B. Pipe A contains carbon tetra chloride (1.594) under a pressure of 11.772N/cm^2 and pipe B contains oil (0.8) under a pressure of 11.772N/cm^2. The pipe A lies 2.5m above pipe B. Find the difference of pressure measured by mercury (13.6) as manometric fluid. The centre of pipe B coincides with manometer liquid in left limb. **(08 Marks)**

Module-2

3 a. Explain the procedure of finding the resultant pressure on a curved surface immersed in a liquid. **(04 Marks)**

b. A circular plate of diameter 0.75m is immersed in a liquid of relative density 0.80 with its plane making an angle of 30° with the horizontal. The centre of the plate is at a depth of 1.50m below the free surface. Calculate the total pressure force on one side of the plate and the location of the centre of pressure. **(08 Marks)**

c. A fluid flow field is given by
$V = x^2yi + y^2zj - (2xyz + yz^2)K$. Prove that it is a core of possible steady in compressible fluid flow. Calculate the velocity and acceleration at the point (2, 1, 3). **(08 Marks)**

OR

4 a. Define:
i) Steady and unsteady flow
ii) Compressible and incompressible flow. **(04 Marks)**

b. Define velocity potential function and stream function and give their properties. **(08 Marks)**

c. Check whether the stream function $\psi = 5xy$ is irrotational and if so, determine the corresponding velocity potential function ϕ. **(08 Marks)**

Module-3

5 a. State Impulse-Momentum principle and give its any two applications. **(04 Marks)**

b. Derive the Euler's equation of motion and then obtain Bernoullis equation. **(08 Marks)**

c. A reducer bend having an outlet diameter of 15cms discharges freely, the bend, connected to a pipe of 20cms diameter has a deflection of 60° (that is, change from initial to final direction is 60°) and lies in horizontal plane. Determine the magnitude and direction of force on the bend, when a discharge of $0.3m^3$/sec passes through the pipe. **(08 Marks)**

OR

6 a. List the forces present in fluidmotion and give equations of motion. **(06 Marks)**

b. What is Pitot tube? Explain how it is used to find the velocity of flow in pipes or channel. **(06 Marks)**

c. Find the discharge of water flowing through a pipe 30cm diameter placed in an inclined position where a venturimeter is inserted, having a throat diameter of 15cm. The difference of pressure between the main and the throat is measured by a liquid of specific gravity 0.6 in an inverted U-tube which gives a reading of 30cm. The loss of head between the main and the throat is 0.2 times the kinetic head of the pipe. **(08 Marks)**

Module-4

7 a. Give the classification of orifices. **(04 Marks)**

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

c. A tank has two identical orifices in one of its vertical sides. The upper orifice is 3.0m below the water surface and lower orifice is 5.0m below the water surface. If the value of coefficient of velocity for each orifice is 0.96, find the point of intersection of the two jets. **(08 Marks)**

OR

8 a. Explain the different types of Nappe with sketches. **(06 Marks)**

b. Derive the expression for maximum discharge over a broad created weir. **(08 Marks)**

c. Water flows over a rectangular weir 1.0m wide at a depth of 150mm and afterwards passes through a triangular right angles weir, taking coefficient of discharge for the rectangular and triangular weir as 0.62 and 0.59 respectively. Find the depth of water over the triangular weir. **(06 Marks)**

Module-5

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

b. List the different types of loss in pipe flow. **(04 Marks)**

c. When a sudden contraction from 60cm diameter to 30cm is introduced in a horizontal pipeline, the pressure drops from 100kPa at the upstream of the contraction to 80kPa on the downstream. Assuming a coefficient of contraction of 0.65, i) Estimate the flow rate in the pipe and ii) the loss of head due to sudden contraction. **(08 Marks)**

OR

10 a. What is water hammer? List the factors upon which it depends. **(06 Marks)**

b. Obtain Dupit's equation for equivalent pipe. **(06 Marks)**

c. Derive an expression for pressure rise in a pipe due to sudden closure of valve considering the elasticity of pipe material and compressibility of fluid. **(08 Marks)**

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CBCS SCHEME

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18CV34

Third Semester B.E. Degree Examination, Aug./Sept.2020
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. Write the requirements of good building stones. Explain the factors causing deterioration of stone work and preservation of stone work. **(10 Marks)**

b. Explain briefly the tests conducted on bricks. **(10 Marks)**

OR

2 a. Explain the importance of size, shape and texture of coarse aggregates. **(10 Marks)**

b. Explain bulking with reference to fine aggregates with its importance and how the test for bulking is done. **(10 Marks)**

Module-2

3 a. Explain briefly the essential requirement of good foundation. **(10 Marks)**

b. Explain with sketches the following types of foundation :
(i) Combined footing
(ii) Strap beam footing. **(10 Marks)**

OR

4 a. Explain with sketches the features of English bond and Flemish bond in brick masonry, with their merits and demerits. **(10 Marks)**

b. Explain briefly following types of walls:
(i) Load bearing wall
(ii) Partition wall
(iii) Cavity wall. **(10 Marks)**

Module-3

5 a. Explain various modes failures of an arch. **(10 Marks)**

b. Define Lintel. Draw a neat sketch of an R.C.C. lintel with chejja indicating the positions of reinforcements. **(10 Marks)**

OR

6 a. Explain the factors which contribute in selection of flooring materials. **(10 Marks)**

b. Draw a neat sketch of a kind post truss indicating various elements. **(10 Marks)**

Module-4

7 a. Explain briefly the guidelines to be followed while locating doors and windows. **(10 Marks)**

b. Explain with neat sketches the following :
(i) Corner window
(ii) Bay window **(10 Marks)**

OR

8 a. Plan a doglegged stair for a building in which vertical distance between the floors is 3.6m. The stair room measures 3m × 5m (internal dimensions). **(10 Marks)**

b. Write short notes on :
(i) Shoring
(ii) Under pinning **(10 Marks)**

Module-5

9 a. Mention the objectives of plastering? Explain the requirements of good plaster and defects in plastering. **(10 Marks)**

b. What are the causes of dampness? Explain any one method of damp proofing. **(10 Marks)**

OR

10 a. Mention the objectives of painting and point out the characteristics of an ideal paint. **(10 Marks)**

b. Explain the procedure for :
(i) Painting on new wood work
(ii) Painting on new iron work and steel work. **(10 Marks)**

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CBCS SCHEME

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18CV35

Third Semester B.E. Degree Examination, Aug./Sept.2020
Basic Surveying

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Distinguish between : (i) Plane survey and Geodetic survey. (ii) Plan and map. (iii) Accuracy and precision. **(06 Marks)**

b. What is ranging? Explain indirect or reciprocal ranging with neat sketch. **(08 Marks)**

c. A line was measured by a 20 mt chain which was accurate before starting the day's work. After chaining 900 mt, the chain was found to be 6 cms too long. After chaining a total distance at 1575 mt, the chain was found to be 14 cms too long. Find the true distance at the line. **(06 Marks)**

OR

2 a. How is chaining performed on sloping ground by Direct method? Explain. **(06 Marks)**

b. Explain the Basic Principles of surveying. **(06 Marks)**

c. In chaining pasta pond, stations A and D on the main line, were taken on the opposite sides of the pond. On the Left of AD, a line AB, 200 mt long was laid down and a second line, AC 250 mt long was ranged on the right of AD, the points B, D and C being in the same straight line. BD and DC were then chained and found to be 125 mt and 150 mt respectively. Find the length of AD. **(08 Marks)**

Module-2

3 a. Distinguish between :
(i) Magnetic meridian and True Meridian (ii) WCB and QB.
(iii) Isgonic line and Agonic line. **(06 Marks)**

b. Differentiate between prismatic compass and surveyor's compass. **(06 Marks)**

c. Following bearing were observed with a compass. Calculate the interior angles. **(08 Marks)**

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

OR

4 a. Define : (i) True menedian and time bearing.
(ii) Isogonic line and Agonic line.
(iii) Fore bearing and Back bearing. **(06 Marks)**

b. The following are the bearings of a closed traverse ABCDEA. At what stations , do you suspect the local attraction? Find the corrected bearings of the lines. **(07 Marks)**

Line	FB	BB
AB	124°30′	304°30′
BC	68°15′	246°0′
CD	310°30′	135°15′
DA	200°15′	17°45′

c. In the following traverse ABCDE, the length and bearing of line EA is omitted, calculate the length and bearing of line EA. **(07 Marks)**

Line	Length (m)	Fore Bearing (FB)
AB	204.0	87°30′
BC	226.0	20°20′
CD	187.0	280°0′
DE	192.0	210°03′
EA	?	?

Module-3

5 a. Define the following terms:
(i) Benchmark (ii) Back sight (iii) MSL (iv) Reduced Level. **(04 Marks)**

b. Explain the temporary adjustments of Dumpy level. **(07 Marks)**

c. Following consecutive readings were taken with a level and a 4 mt leveling staff on a continuously sloping ground at common interval at 30 mt.
0.855 (on A), 1.545, 2.335, 3.115, 3.825, 0.455, 1.380, 2.055, 2.855, 3.455, 0.585, 1.015, 1.850, 2.755, 3.845 (on B).
The R.L of A was 380.500 mt. Make entries in a level book format and apply the usual check. Also determine the gradient at the line AB. **(09 Marks)**

OR

6 a. Define the following terms:
(i) Benchmark (ii) Reciprocal leveling (iii) Height of Instrument
(iv) Change point **(06 Marks)**

b. Explain the temporary adjustments of Dumpy level. **(07 Marks)**

c. The following staff reading were observed successively with a level, the instrument having been moved after 3rd, 6th and 8th readings:
2.228, 1.606, 0.988, 2.090, 2.864, 1.262, 0.602, 1.982, 1.044, 2.684
Enter the readings in level book format and calculated RL of all the points by Rise and Fall method if the first reading was taken with a staff held on Benchmark of elevation 432.384 mt. **(07 Marks)**

Module-4

7 a. List the advantages and disadvantages of plane table surveying. **(08 Marks)**

b. What is the practical utility of three-point point? **(04 Marks)**

c. Explain Radiation and intersection method of plane table surveying. **(08 Marks)**

OR

8 a. Explain the term orientation of plane table. Discuss orientation by back sighting. **(06 Marks)**

b. List the methods of plane table surveying. Explain radiation method. **(07 Marks)**

c. What is three-point problem? How is it solved graphically by Bessel's method? **(07 Marks)**

Module-5

9 a. Define a contour. Explain the characteristics of contour. **(08 Marks)**

b. The following perpendicular offsets were taken at 10 mt intervals from a survey time to an irregular boundary line : 3.25, 5.60, 4.20, 6.65, 8.75, 6.20, 3.25, 4.20, 5.65
Calculate the area enclosed between the survey line, the irregular boundary line and the first and last offset by the applications of,
(i) Average ordinate rule.
(ii) Trapezoidal rule.
(iii) Simpson's rule. **(12 Marks)**

OR

10 a. Discuss the methods of determining volumes. **(06 Marks)**

b. List the uses of contours. **(04 Marks)**

c. A Railway embankment is 10 mt wide with side slopes $1\frac{1}{2}:1$. Assuming the ground to be level in a direction transverse to the centre line, calculate the volume contained in a length of 120 mt, the centre heights at 20 mt intervals being in meters.
2.2, 3.7, 3.8, 4.0, 3.8, 2.8, 2.5
Use Trapezoidal and Prismoidal rules. **(10 Marks)**

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CBCS SCHEME

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17CV/CT32

Third Semester B.E. Degree Examination, Aug./Sept. 2020
Strength of Materials

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 can be assumed.*

Module-1

1 a. Define the four elastic constants. **(08 Marks)**

b. A steel rod of 30 mm in diameter is enclosed in an aluminium tube of 32 mm internal diameter and 60 mm external diameter. Both the bars are of length 750 mm and are rigidly connected to each other. The composite bar is subjected to an increase in temperature of 40°C. Compute the stresses in each material due to the temperature increase.
If the bar is also subjected to a compression of 200 kN, compute the resultant stresses. Also, find the final deformation of the compound bar.
Material properties are : $E_S = 200$ GPa, $\alpha_s = 12\times10^{-6}/^{\circ}C$
$E_A = 80$ GPa, $\alpha_A = 22\times10^{-6}/^{\circ}C$ **(12 Marks)**

OR

2 a. Sketch a typical stress strain curve for mild steel and briefly discuss the salient points on the curve. **(06 Marks)**

b. Derive an expression for elongation of a tapering rectangular plate of uniform thickness subjected to an axial load. **(08 Marks)**

c. A steel flat of thickness 25 mm tapers uniformly from 300 mm to 150 mm over a length of 750 mm. If the flat is subjected to an axial tension of 300 kN, compute the elongation of the flat. What is the % error if average area is used in calculating the extension? $E_S = 200$ KN/mm^2. Also, compute the maximum stress. **(06 Marks)**

Module-2

3 a. Show that the sum of the normal stresses on any two perpendicular planes in a general two dimensional system is $(\sigma_x + \sigma_y)$. **(06 Marks)**

b. A closed cylindrical steel vessel 8 m long and 3.2 m internal diameter is subjected to an internal pressure of 5 MPa with thickness of vessel being 50 mm. Assuming E = 200 GPa and $\mu = 0.3$, compute hoop and longitudinal stresses, maximum shear stress and changes in length, diameter and volume. **(08 Marks)**

c. Compute the maximum and minimum hoop stress and plot their variation across the pipe thickness having an internal diameter of 500 mm and thickness 80 mm if the pipe is subjected to an internal fluid pressure of 10 MPa. **(06 Marks)**

OR

4 a. Derive expressions for circumferential and longitudinal stresses in a thin cylinder subjected to internal pressure, p. **(06 Marks)**

b. Direct stresses of magnitude 120 MPa tensile and 80 MPa compressive are acting at a point along with a shear stress of 50 N/mm^2. Compute the normal and tangential stresses on a plane inclined at 40° anticlockwise with the plane on which 120 MPa tensile stress is acting. Also, compute the magnitudes of principal stresses and planes. Sketch the stresses and their planes. **(14 Marks)**

Module-3

5 a. A Cantilever beam is subjected to a UDL of 20 kN/m throughout its length. Sketch SFD and BMD indicating salient values. Cantilever length = 3 m. **(05 Marks)**

b. Sketch SFD and BMD for the beam shown in Fig. Q5 (b) indicating salient values (including point of contraflexure, maximum –ve and maximum +ve BMS and maximum SF). **(15 Marks)**

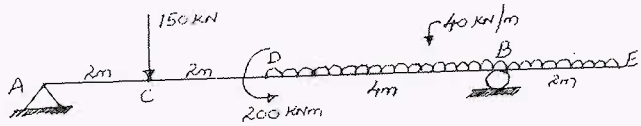

Fig. Q5 (b)

OR

6 a. A simply supported beam of span 8 m is carrying a concentrated load of 100 kN at a distance of 3 m from the left support. Sketch SFD and BMD indicating salient values. **(05 Marks)**

b. Sketch SFD and BMD for the beam shown in Fig. Q6 (b) indicating salient values (including point of contraflexure, maximum –ve and maximum +ve BMS and maximum SF). **(15 Marks)**

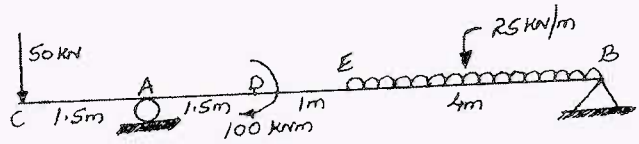

Fig. Q6 (b)

Module-4

7 a. Show that the strength of hollow shafts is greater than solid shaft having same material, length and weight. **(08 Marks)**

b. Explain maximum shear stress theory of failure. **(06 Marks)**

c. A steel shaft of diameter 150 mm transmits 250 kW at 200 rpm with $T_{max} = 1.35T_{mean}$. Compute the maximum shear stress and sketch the stress variation. **(06 Marks)**

OR

8 a. Explain maximum strain energy theory of failure. **(06 Marks)**

b. A hollow circular shaft rotates at 200 rpm transmitting a power of 600 KW. Compute the diameters of the shaft if the external diameter is 1.5 times the internal diameter permissible shear stress in the material is 80 MPa and the angle of twist is 1.1° over a length of 3 m. $T_{max} = 1.35\ T_{mean}$ and G = 80 GPa. Also, calculate the torque carried by a solid shaft of same length, cross sectional area and material as that of hollow shaft with the permissible shear stress and angle of twist being same. What is the percentage difference in torque carrying capacities? **(14 Marks)**

Module-5

9 a. Derive an expression for Euler's crippling load in a column with one end fixed and other end free. **(10 Marks)**

b. An unsymmetrical I section with top flange 300×20, bottom flange 150×15 and web thickness of 12 mm is used as a simply supported beam of span 6 m with a uniformly distributed load of 40 kN/m over its entire length. Overall depth of beam is 400 mm. Compute the maximum tensile and compressive stresses and sketch the bending stress distribution. Also, compute the shear stresses at salient points and sketch the shear stress distribution at support. **(10 Marks)**

OR

10 a. Derive an expression for shear stress in a beam with usual notations. **(10 Marks)**

b. A hollow rectangular column having external dimensions of 250×375 with thickness = 10 mm is used as a column of length 3.5 m with both ends of the column being fixed. Compute the buckling load using both the formulae. E = 200 GPa, Rankine's constant are $\alpha = \frac{1}{7500}$ and $\sigma_c = 320\ N/mm^2$. Comment on the formula giving larger load. **(10 Marks)**

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CBCS SCHEME

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17CV33

Third Semester B.E. Degree Examination, Aug./Sept.2020
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. Distinguish between:
(i) Ideal fluids and real fluids
(ii) Surface tension and capillarity
(iii) Absolute pressure and gauge pressure
(iv) Newtonian and non Newtonian fluids **(10 Marks)**

b. Calculate the dynamic viscosity of oil which is used for lubrication between a square plate 0.8 × 0.8 m size and inclined plane with angle of inclination of 30°. The weight of square plate is 300 N and it slides down the inclined plane with a uniform velocity of 0.3 m/s the thickness of oil film is 1.5 mm. **(06 Marks)**

c. An oil of specific gravity is 0.8 under a pressure of 137.2 kN/m^2. What is the pressure head (i) expressed in metre of water (ii) expressed in metre of oil? **(04 Marks)**

OR

2 a. State and prove Pascal's law. **(06 Marks)**

b. Calculate the capillary rise in a glass tube of 2.5 mm diameter when immersed vertically in (i) water (ii) mercury. Take surface tension $\sigma = 0.0725$ N/m for water and $\sigma = 0.52$ N/m for mercury. For mercury angle of contact = 130°. **(06 Marks)**

c. A simple U – tube manometer containing mercury is connected to a pipe in which a fluid of specific gravity 0.8 and having vacuum pressure is flowing. The other end of the manometer is open to atmosphere. Find the vacuum pressure in pipe. If the difference of mercury level in the two limbs is 40 cm and the height of fluid in the left from the centre of pipe is 15 cm below. **(08 Marks)**

Module-2

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

b. If for a two-dimensional potential flow, the velocity potential is given by $\phi = x(2y - 1)$. Determine the velocity at the point P(4, 5). Also determine the value of stream function ψ at the point P. **(06 Marks)**

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

OR

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

b. Find the total pressure and position of centre of pressure on a triangular plate of base 2m and height 3m which is immersed in water in such a way that the plane of the plate makes an angle of 60° with the free surface of the water. The base of the plate is parallel to water surface and at a depth of 2.5 m from water surface. **(08 Marks)**

c. The velocity components in a two dimensional flow are $u = \frac{y^3}{3} + 2x - x^2y$ and $v = xy^2 - 2y - \frac{x^3}{3}$. Show that these components represent a possible case of an irrotational flow. **(06 Marks)**

Module-3

5 a. State the Bernoulli's theorem. Derive the Bernoulli's equation starting from Euler's equation of motion along a stream line. **(08 Marks)**

b. Define: (i) Forced vortex (ii) Free vortex with examples. **(04 Marks)**

c. The inlet and throat diameters of a horizontal venturimeter are 30 cm and 10 cm respectively. The liquid flowing through the venturimeter is water. The pressure intensity at inlet is 13.734 N/cm^2 while the vacuum pressure head at the throat is 37 cm of mercury. Find the rate of flow. Take $C_d = 0.98$. **(08 Marks)**

OR

6 a. Derive an expression for the discharge through a venturimeter. **(08 Marks)**

b. 250 l/s of water flowing in a pipe having a diameter of 300 mm. If the pipe is bend by 135° (i.e. change from initial to final direction is 135°). Find the magnitude and direction of the resultant force on the bend, when the pressure of water flowing is 39.24 N/cm^2. **(08 Marks)**

c. A pilot state tube is used to measure the velocity of water in a pipe. The stagnation pressure head is 6m and state pressure head is 5m. Calculate the velocity of flow assuming coefficient of tube = 0.98. **(04 Marks)**

Module-4

7 a. Define hydraulic coefficients and obtain the relation between them. **(06 Marks)**

b. Differentiate between : (i) Notch and Weir (ii) Orifice and mouth piece **(06 Marks)**

c. A rectangular weir of crest length 50 cm is used to measure the rate of flow of water in a rectangular channel of 80 cm wide and 70 cm deep. Determine the discharge in the channel if the water level is 80 mm above the crest of weir. Take velocity of approach into consideration, $C_d = 0.62$. **(08 Marks)**

OR

8 a. Derive an expression for discharge through a triangular notch. **(08 Marks)**

b. A right angled V-notch is used for measuring a discharge of 30 l/s. An error of 1.5 mm was made while measuring the head over the notch. Calculate the percentage error in discharge $C_d = 0.62$. **(06 Marks)**

c. The head of water over an orifice of diameter 100 mm is 10 m. The water coming out from orifice is collected in a circular tank of diameter 1.5m. The rise of water level in this tank is 1.0 m in 25 seconds. Also the coordinates of a point on the jet, measured from vena contracta are 4.3 m horizontal and 0.5m vertical. Find the hydraulic coefficient of orifice. **(06 Marks)**

Module-5

9 a. Explain: (i) Equivalent pipe (ii) Pipe in parallel (iii) Pipe in series **(06 Marks)**

b. A pipe of diameter 20 cm and length 2000 m connects two reservoirs, having difference of water levels as 20 m. Determine the discharge through the pipe, if an additional pipe of diameter 20 cm and length 1200 m is attached to the last 1200 m of length of the existing pipe. Find the increase in discharge. Take f = 0.015 and neglect minor losses. **(10 Marks)**

c. Explain water hammer in pipes. **(04 Marks)**

OR

10 a. Explain minor losses. Give expression for head loss due to :
(i) Sudden expansion (ii) Major loss. **(06 Marks)**

b. A valve is provided at the end of a cast iron pipe of diameter 150 mm and of thickness 10 mm. The water is flowing through the pipe which is suddenly stopped by closing the valve. Find the maximum velocity of water when the rise of pressure due to sudden closure of valve is 196.2 N/cm^2. Take K for water as 19.62×10^4 N/cm^2 and E for cast iron pipe as 11.772×10^6 N/cm^2. **(06 Marks)**

c. Explain:
(i) Hydraulic gradient line and total energy line
(ii) Hardy cross method
(iii) Gradual closure of valve **(08 Marks)**

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CBCS SCHEME

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17CV34

Third Semester B.E. Degree Examination, Aug./Sept.2020
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. Explain briefly principles of surveying. **(08 Marks)**

b. Differentiate between Plan and Map. **(04 Marks)**

c. A 20m chain was found to be 10cm too long after chaining a distance of 1500m. It was found to be 18cm too long at the end of days work after chaining a total distance of 2900m. Find the true distance if the chain was correct before the commencement of the work. **(08 Marks)**

OR

2 a. Define Ranging. Explain indirect or reciprocal ranging. **(06 Marks)**

b. Discuss the classification of surveying. **(08 Marks)**

c. In passing an obstacle in the form of a pond, stations, A & D on the main line, were taken on the opposite sides of the pond. On the left of AD, a line AB, 200m long was laid down and a second line AC 250m long was ranged on the right of AD, the points B, D and C being in the same straight line. BD and DC were chained and found to be 125m and 150m respectively. Find the length of AD. **(06 Marks)**

Module-2

3 a. Distinguish between i) Fore bearing and back bearing ii) Whole circle bearing and quadrantal bearing iii) Closed traverse and open traverse. **(06 Marks)**

b. Differentiate between Prismatic compass and Surveyor's compass. **(06 Marks)**

c. The following bearings were observed with a compass. Calculate the interior angles and apply the check. **(08 Marks)**

Line	AB	BC	CD	DE	EA
FB	$60^0\ 30'$	$122^0\ 0'$	$46^0\ 0'$	$205^0\ 30'$	$300^0\ 0'$

OR

4 a. Explain the measurement of a horizontal angle by repetition method. List the errors eliminated by this method. **(07 Marks)**

b. What are the permanent adjustment of a theodolite? Explain the spire test. **(06 Marks)**

c. The following bearings were observed while traversing with a compass.

Line	AB	BC	CD	DE
FB	$45^0\ 45'$	$96^0\ 55'$	$29^0\ 45'$	$324^0\ 48'$
BB	$226^0\ 10'$	$277^0\ 5'$	$209^0\ 10'$	$144^0\ 48'$

Mention which stations were affected by local attraction and determine the corrected bearings. **(07 Marks)**

Module-3

5 a. What is meant by balancing of traverse? Explain the Bowditch's and Transit method of adjusting the traverse. **(08 Marks)**

b. Define : i) Latitude and Departure ii) Dependent co-ordinates and independent co-ordinates. **(04 Marks)**

c. Calculate the error of closure of adjust the following traverse by using transit rule. **(08 Marks)**

Line	PQ	QR	RS	SP
Latitude	123.35	93.82	-177.44	-39.21
Departure	35.68	205.86	70.11	-312.25

OR

6 a. Derive the expression for distance and elevation when the staff held vertical and the line of sight is inclined. **(10 Marks)**

b. Determine the gradient from point A to a point B from the following observations made with a tachometer fitted with an annalistic lens. The constant of instrument was 100 and the staff was held vertically. (Take RL of instrument axis 100.000m). **(10 Marks)**

Inst station	Staff point	Bearing	Vertical angle	Staff readings
P	A	134^0	$+10^0\ 32'$	1.360, 1.915, 2.470
	B	224^0	$+5^0\ 6'$	1.065, 1.885, 2.705

Module-4

7 a. Define the following terms : i) Benchmark ii) Back sight iii) Reduced level iv) For sight v) Height of instrument vi) Turning point. **(06 Marks)**

b. Explain the temporary adjustment of a dumpy level. **(06 Marks)**

c. To find the elevation of the top 'Q' of a hill, a flag staff of 2m height was erected and observations were made from stations 'P' & 'R' 60m apart. The horizontal angle measured at P between R and the top of the flag staff was $60^0\ 30'$ and that measured at R between the top of the flag staff and P was $68^0\ 18'$. The angle of elevation to the top of the flag staff 'Q' was measured to be $10^0\ 12'$ at P and that at R was $10^0\ 48'$. Staff reading on BM when the instrument was at P is 1.965m and with the instrument at R 2.055m. Calculate the elevation of the top of the hill if that of B.M was 435.065 meters. **(08 Marks)**

OR

8 a. Derive an expression for the horizontal distance, vertical distance and elevation of an object by single plane method, when the base is inaccessible. **(10 Marks)**

b. The following staff readings were observed successively with a level, the instrument was shifted after third, sixth and eight readings : 2.228 , 1.606 , 0.988 , 2.090 , 2.864 , 1.262 , 0.602 , 1.982 , 1.044 , 2.684 meters. Rule out a page of level book and determine the RL of points if the first reading was taken with a staff held on a bench mark of 432.384m. **(10 Marks)**

Module-5

9 a. Discuss the methods of determining areas and volumes. **(06 Marks)**

b. Define Contour. List the uses of contour maps. **(06 Marks)**

c. A series of offsets were taken from a chair line to a curved boundary line at intervals of 15 meters in the following order. 0 , 2.65 , 3.80 , 3.75 , 4.65 , 3.60 , 4.95 , 5.85m. Compute the area between chain line, the curved boundary and the end offsets by i) Trapezoidal rule ii) Simpsons's rule. **(08 Marks)**

OR

10 a. Explain the characteristics of contours with a sketches. **(07 Marks)**

b. Define the following terms : i) Contour interval ii) Horizontal equivalent iii) Contour gradient. **(03 Marks)**

c. A railway embankment is 10m wide with side slopes 1½ to 1. Assuming the ground to be level in a direction transverse to the centre line, calculate the volume contained in a length of 120 meters, the centre heights at 20m intervals being in meters. 2.2 , 3.7 , 3.8 , 4.0 , 3.8 , 2.8 , 2.5. By i) Trapezoidal rule ii) Simpson's rule / Prismoidal rule. **(10 Marks)**

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15CV/CT32

Third Semester B.E. Degree Examination, Aug./Sept.2020
Strength of Material

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Derive an expression for circular bar of uniformly varying cross - section. **(08 Marks)**

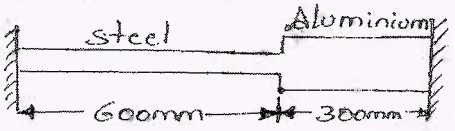
b. A composite section comprises a steel tube 100mm internal diameter 120mm, externally fitted inside a brass tube of 140mm internal diameter and 160mm external diameter. The assembly is subjected to a compressive load of 500kN. Find the load carried by the tube and the stresses generated in them. The length of tube is 1500mm. Take $E_{steel} = 200 \times 10^3$ N/mm^2 and $E_{brass} = 100 \times 10^3$ N/mm^2. What is the change in length of tube? **(08 Marks)**

OR

2 a. Derive the relationship between Bulk modulus (K) , Young's modulus (E) and Poisson's ratio (μ). **(08 Marks)**

b. A composite bar made of aluminum and steel is held between two supports as shown in fig. Q2(b). What will be the stress in bars? When temperature falls by 20^{0}C, given that the bars were initially stress – free. The supports are unyielding. Cross – sectional area of steel bar is 200mm^2 and that of aluminum is 300mm^2. **(08 Marks)**

Fig.Q2(b)

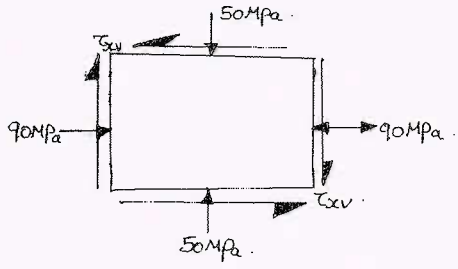


Module-2

3 a. Derive an expression for maximum normal stress on a plane inclined at an angle 'θ', subjected to two dimensional stress systems. **(08 Marks)**

b. For the two – dimensional stressed element, shown in fig. Q3(b), determine the value of i) Minimum principal stress ii) Shear stress iii) The normal stress on the plane of maximum shear iv) The maximum shear stress if major principal stress is 100 MPa. **(08 Marks)**

Fig.Q3(b)



OR

4 a. Derive Lame's equation for thick cylinder. **(08 Marks)**

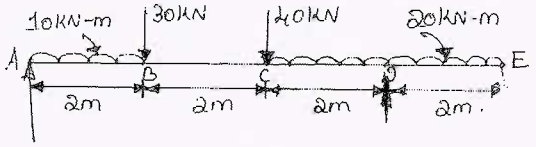
b. A thick cylinder of internal diameter 160mm is subjected to an internal pressure of 25N/mm^2. If the allowable stress in the material is 120N/mm^2, find the required wall thickness of the cylinder. **(08 Marks)**

Module-3

5 a. With a neat sketch, explain types of beams , types of loads and types of supports. **(08 Marks)**

b. For the beam, shown in fig. Q5(b), draw the shear force and bending moment diagram and locate the point of contra flexure if any. **(08 Marks)**

Fig.Q5(b)

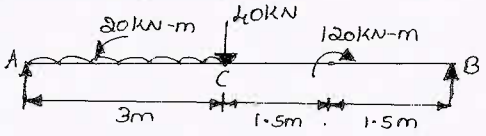


OR

6 a. Derive the relation between UDL , SF and BM. **(06 Marks)**

b. Draw SFD and BMD for the beam shown in Q6(b). Determine the maximum BM and its location. Locate the points of contraflexure. **(10 Marks)**

Fig.Q6(b)

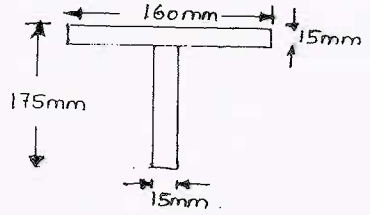


Module-4

7 a. Derive the general Bending equation $\frac{M}{I} = \frac{E}{R} = \frac{f}{Y}$. **(08 Marks)**

b. A cross section of beam is as shown in fig. Q7(b). the shear force on the section is 400 kN. Estimate the shear stress at various points and plot the shear stress distribution diagram.

Fig.Q7(b)



(08 Marks)

OR

8 a. Show that $P_{cr} = \frac{\pi^2 EI}{\ell^2}$ for a long column hinged at both ends. **(08 Marks)**

b. A solid round bar of 60mm diameter and 2.5m long is used as a strut. Find the safe compressive load for the strut if i) Both ends are hinged ii) Both ends are fixed. **(08 Marks)**

Module-5

9 a. Derive $\left[\frac{T}{I_\rho} = \frac{f_s}{R} = \frac{C\theta}{L}\right]$. **(08 Marks)**

b. Define the followings in theories of failures in brief : i) Rankines theory ii) Tresca's theory iii) Beltrami & Haieghs theory iv) St. Venants theory. **(08 Marks)**

OR

10 a. A hallow shaft having internal diameter 40% of external diameter, transmits 562.5kW power of 100 rpm. Determine the cross – section dimension of the shaft if shear stress is not to exceed 60MPa and twist in a length of 2.5m should not exceed 1.3^0, Maximum torque transmitted is 25% , higher than average torque Rigidity modulus = 90 GPa. **(08 Marks)**

b. A solid circular shaft that transmits 250 kN at 100 rpm. If the shear stress is not to exceed 75 MPa. What should be the diameter of the shaft? If this shaft is to be replaced by a hallow one, whose diameter ratio is 0.6. Determine the size and percentage saving in weight , the maximum shear stress being is same. **(08 Marks)**

CBCS SCHEME

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15CV33

Third Semester B.E. Degree Examination, Aug./Sept.2020
Fluid Mechanics

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Define : Mass density , Specific gravity , Specific weight. Give the relationship between them. Also write their units and dimensions. **(08 Marks)**

b. A closed tank contains 0.5m depth of mercury, 2m of water and 3m of oil (S = 0.6) with air above the oil. If the gauge pressure at the bottom of the tank is 196.2kPa, what is the pressure of air at top of the tank? Also find absolute pressure if P_{atm} = 101.043kPa. **(08 Marks)**

OR

2 a. Define Absolute , Gauge and Atmospheric pressure. Give relationship between them through sketch. **(04 Marks)**

b. One litre of crude oil weighs 9.6N. Calculate specific weight, density and specific gravity. **(06 Marks)**

c. A cube of 25cm sides slides down on incline plane of 2V : 3H with a velocity of 20m/s. The inclined surface is covered by 0.02mm thick oil film of viscosity 2.2×10^{-3} Pas. What is the weight of the cube? **(06 Marks)**

Module-2

3 a. Distinguish between : i) Center of pressure and Center of gravity ii) Stream line and Path line iii) Convective acceleration and temporal acceleration. **(06 Marks)**

b. A circular disc of diameter 0.75m is immersed in a liquid of S = 0.8 with its plane making 30^0 with horizontal. The centre of plate is at 1.5m below free surface. Calculate the total pressure and center of pressure. **(04 Marks)**

c. The velocity vector for a 2D flow is given by :

$$\bar{V} = \left[\frac{y^3}{3} + 2x - x^2y\right]i + \left[xy^2 - 2y - \frac{x^3}{3}\right].$$ Obtain the expression for stream function. **(06 Marks)**

OR

4 a. Derive the continuity equation for a 3D flow using Cartesian coordinate system for steady incompressible flow. **(08 Marks)**

b. The velocity vector in a fluid flow is $\bar{V} = 4x^3\,i - 10x^2y\,j + 2t\,k$. Find velocity and acceleration components at point (2, 1, 3) when t = 1. **(08 Marks)**

Module-3

5 a. Derive an expression for discharge through horizontal venturimeter carrying water. **(06 Marks)**

b. List the assumptions made during derivation of Bernoulli's equation. **(04 Marks)**

c. Water is flowing through a tapering pipe having diameters 300mm and 150mm at section 1 and 2 which are 10m above and 6m below datum respectively. If the pressure at section 1 is 400 kPa and discharge is 40 lps determine velocity and pressure at section 2. What is velocity at section 1? Neglect losses. **(06 Marks)**

OR

6 a. Derive an equation for velocity of flow at a point using pitot tube. **(04 Marks)**

b. 300 ℓps of water is flowing in a pipe of 30cm diameter with a gauge pressure of $400kN/m^2$. If the pipe is bent by 90^0, find the magnitude and direction of force on the bend. **(07 Marks)**

c. A horizontal venturimeter with inlet and throat diameter 25cm and 15cm respectively is used to measure discharge of water in a pipe. $C_d = 0.98$. If the U – tube mercury manometer connected to it reads 30cm level difference, find the discharge. **(05 Marks)**

Module-4

7 a. Derive the expression $C_V = \frac{x}{2\sqrt{yH}}$ with usual notations. **(06 Marks)**

b. The head over rectangular notch is 90cm and discharge is 300ℓps. Find the length of crest. $C_d = 0.62$. **(04 Marks)**

c. Give classification of orifices and mouth pieces. **(06 Marks)**

OR

8 a. Derive an equation for discharge over a rectangular sharp crested weir. **(08 Marks)**

b. A 25mm diameter orifice discharges $22m^3$ of water per minute when the head is 6m. The diameter of jet at Vena – Contracta is 22.5mm. Determine C_c , C_d and C_v. **(08 Marks)**

Module-5

9 a. Derive Darcy – Weisbach equation for head loss through a pipe. **(08 Marks)**

b. A 0.5m diameter and 100m long pipeline carrying $0.5m^3/s$ of water is fitted with a valve at downstream end. Calculate the rise in pressure caused due to closure of valve in time :
i) 0.1 sec and ii) 1 sec. Take sonic velocity = 1430m/s. **(08 Marks)**

OR

10 a. A pipe of 40m length is connected to water tank at one end and discharges freely into the atmosphere at other end. For the first 25m length from the tank the pipe is 15cm in diameter and for remaining part, its diameter is 30cm. The pipe is horizontal and water level in tank is 8m above the center of pipe. Taking f = 0.01 in $h_f = \frac{FLV^2}{2gD}$ and considering all losses, determine the discharge through pipe. Also sketch HGL and TEL. **(12 Marks)**

b. Derive an expression for instantaneous pressure in the pipe due to gradual closure of value fitted at the end. **(04 Marks)**

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17CV42

Fourth Semester B.E. Degree Examination, Aug./Sept. 2020
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 suitably.***

Module-1

1 a. Define linear and nonlinear systems. **(06 Marks)**

b. Distinguish between static indeterminacy and kinematic indeterminacy. **(06 Marks)**

c. Determine static and kinematic indeterminacy for the following structures.

Fig Q1(c) – (i)

Fig Q1(c) – (ii) **(08 Marks)**

OR

2 a. What are the assumptions made in the analysis of trusses? **(04 Marks)**

b. Distinguish perfect and imperfect frames. **(04 Marks)**

c. Find the forces in all members of truss shown in Fig Q2(c).

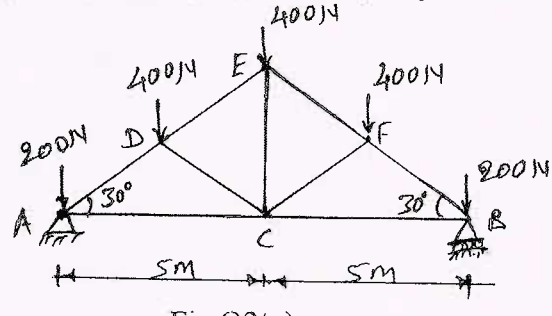

Fig Q2(c) **(12 Marks)**

Module-2

3 a. State the moment area theorems. **(04 Marks)**

b. Find the slope and deflection at the free end of cantilever beam subjected to udl w/m on its entire length by moment area method. **(06 Marks)**

c. For the cantilever beam shown in Fig Q3(c), compute the slope and defection at the free end. Take EI = 4×10^{12} Nmm^2. Use Macaulay's method.

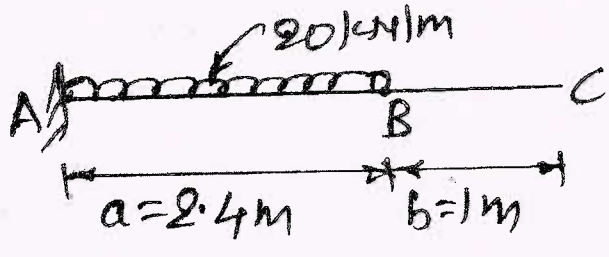

Fig Q3(c) **(10 Marks)**

OR

4 a. Determine the slopes at the supports and deflection under the point load by conjugate beam method.

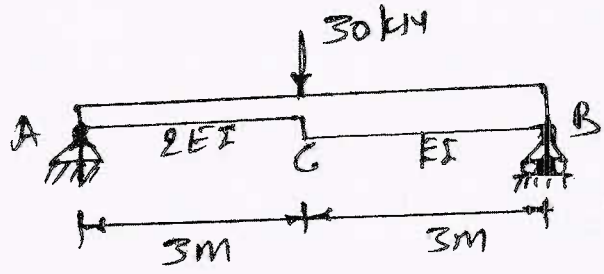

Fig Q4(a) **(10 Marks)**

b. Determine the defection under the load points shown in Fig Q4(b) by Macanlay's method. Take EI = 1×10^{12} Nmm^2.

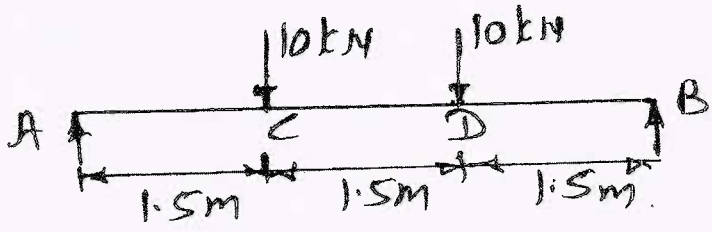

Fig Q4(b) **(10 Marks)**

Module-3

5 a. Derive the strain energy stored in a beam due to bending. **(06 Marks)**

b. Compute the deflection and rotation (slope) at the free end C of cantilever beam by unit load method. Shown in Fig Q5(b). Take E = 200 GPa I = 8×10^7 mm^4.

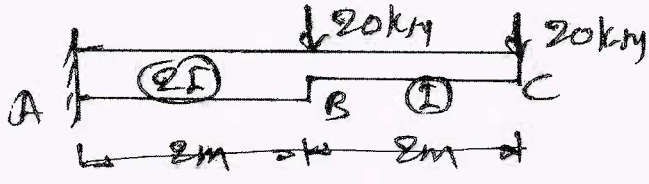

Fig Q5(b) **(14 Marks)**

OR

6 a. Determine the horizontal deflection at D for the frame shown in Fig Q6(a) by Castiglione's theorem. Take EI constant. E = 2×10^5 N/mm^2, I = 8×10^8 mm^4.

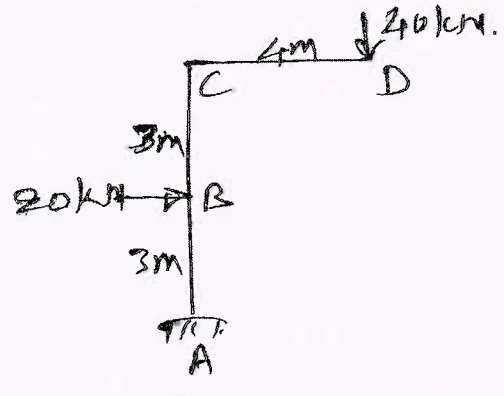

Fig Q6(a) **(11 Marks)**

b. Find the vertical deflection at joint C for the truss shown in Fig Q6(b) by unit load method c/s area of CD and DE are each 2500mm^2 and those of other are each 1250 mm^2. Take E = 200 kN/mm^2

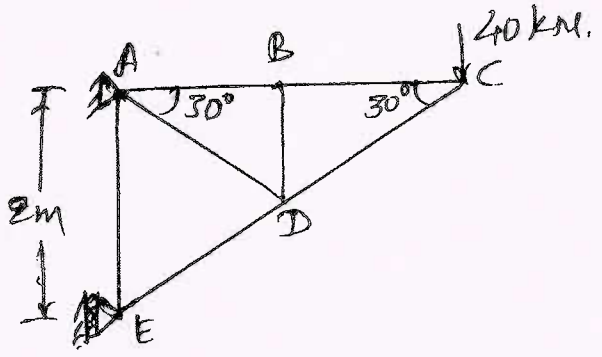

Fig Q6(b) **(09 Marks)**

Module-4

7 A three hinged parabolic arch of span 18m and rise to crown hinge 3m carries a load of 120kN at the left quarter span. Find the BM, normal thrust and radial shear at section under the load. Also find maximum positive and negative b.m. in the arch. Sketch BMD. **(20 Marks)**

OR

8 A cable of span 120m and dip 10m carries a load of 6kN/m of horizontal span. Find the maximum tension in the cable and inclination of cable at the support. Find the forces transmitted to the supporting pier if the cable passes over smooth pulleys on top of pier. The anchor cable is at 30° to the horizontal. Determine the maximum bending moment for the pier if height of pier is 15m. **(20 Marks)**

Module-5

9 a. What are the uses of influence lines? **(05 Marks)**

b. A simply supported beam has a span of 15m. A udl of 40kN/m and 5m long crosses the girder from left to right. Draw the influence line diagram for SF and BM at a section 6m from left end. Using these diagrams. Calculate maximum SF and BM at this section. Also determine the position and magnitude of absolute maximum BM in the beam. **(15 Marks)**

OR

10 A train of 5 wheel loads as shown in Fig Q10 crosses a simply supported beam of span 24m from left to right. Calculate the maximum positive and negative SF values at the centre of span and the absolute maximum B.M anywhere in the span.

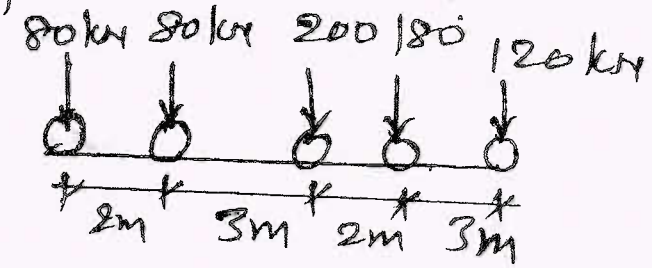

Fig Q10 **(20 Marks)**

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CBCS SCHEME

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17CV43

Fourth Semester B.E. Degree Examination, Aug./Sept.2020
Applied Hydraulics

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 suitably.

Module-1

1 a. Differentiate between dimensionally homogeneous and non-homogeneous with an example each. **(06 Marks)**

b. What is dimensional analysis? Mention its uses. **(06 Marks)**

c. Capillary rise 'h' depends upon density 'ρ', acceleration due to gravity, 'g', surface tension, 'σ' and radius of tube, 'r'. Show by Buckingham π – theorem that,

$$\frac{h}{r} = \phi\left[\frac{\sigma}{\rho g r^2}\right]$$ **(08 Marks)**

OR

2 a. Explain Reynold's model law and give the areas where it is applied. **(06 Marks)**

b. What are distorted and undistorted models? **(04 Marks)**

c. The discharge and velocity of flow over the model of a spillway of a dam were measured to be 2.0 m^3/s and 2.5 m/s respectively. If the model is built to a scale of 1:36, compute the velocity and discharge over its prototype. **(10 Marks)**

Module-2

3 a. Derive Chezy's equation for uniform flow in open channel and thereby deduce Manning's formula for velocity in open channel. **(08 Marks)**

b. A circular open channel laid to a gradient of 1:9000 carries a discharge of 0.40 m^3/s. If the depth of flow is 1.25 times the radius of channel, find the diameter of the channel. Assume rugosity coefficient for channel surface as 0.015. **(12 Marks)**

OR

4 a. How do you define specific energy of a flowing? Draw specific energy curve and explain various parameters. **(06 Marks)**

b. Enumerate the characteristics of critical flow through open channels. **(04 Marks)**

c. The discharge in a 4.0 m wide rectangular channel at 1.0m depth of flow is 4.0 m^3/s. Compute (i) Specific energy for 1.0m depth of flow (ii) Critical depth (iii) Alternate depth to 1.0m. **(10 Marks)**

Module-3

5 a. Define hydraulic jump in an open channel flow. Give its applications. **(06 Marks)**

b. Prove that the critical depth (y_c) and the alternate depths y_1 and y_2 are related by the expression, $y_c^3 = \frac{2y_1^2 y_2^2}{(y_1 + y_2)}$, in a rectangular open channel. **(06 Marks)**

c. In a rectangular channel of width 6.0m, the sluice gate discharges with a velocity of 5.0 m/s at a depth of 0.40m. Determine whether a hydraulic jump will occur. Also find (i) Jump height (ii) Energy lost per kg of water and (iii) Power lost in the hydraulic jump. **(08 Marks)**

OR

6 a. Explain classification of surface profiles with neat sketches. **(10 Marks)**

b. A rectangular channel 10m wide carries a discharge of 40 m^3/s. If at a section in this channel, the depth of flow is 1.50m, how far upstream or downstream from this section will the depth be 2.0m. Take channel bedslope as 0.00009 and Manning's N = 0.017. **(10 Marks)**

Module-4

7 a. Derive an expression for the force exerted by a jet striking a moving symmetrical curved vane striking at the center and hence how that the maximum efficiency of this jet-vane system is limited to 16/27. **(10 Marks)**

b. A jet water moving at 20 m/s impinges on a symmetrical curved vane so shaped to deflect the jet through 120°. If the vane is moving at 5.0 m/s, find the angle of jet so that there is no shock at the inlet. Also determine the absolute velocity at the exit in magnitude and direction and the work done per unit weight of water. **(10 Marks)**

OR

8 a. Draw a general layout of a hydro-electric power plant and give the function of each of the components in brief. **(10 Marks)**

b. A Pelton wheel running at a speed of 600 rpm under a head of 820 m develops 13200 kW power. If the coefficient of jet $C_v = 0.98$, Speed ratio, $\phi = 0.46$ and jet diameter is 1/16 of wheel diameter, calculate (i) Pitch circle diameter (ii) Diameter of the jet (iii) Quantity of water supplied to the wheel and (iv) the number of jets required. Assume overall efficiency as 85%. **(10 Marks)**

Module-5

9 a. Draw a neat sketch of a Francis turbine and explain its components. **(04 Marks)**

b. What is a draft tube? Explain its function in a reaction turbine. **(06 Marks)**

c. A Kaplan turbine runner is to be designed to develop 9100 kW power. The net available head is 5.6m. If the speed ratio = 2, flow ratio = 0.68, overall efficiency = 86% and the diameter of boss is equal to $1/3^{rd}$ the diameter of runner, find the diameter of runner, the speed and specific speed of turbine. **(10 Marks)**

OR

10 a. Explain various heads and efficiencies of centrifugal pumps. **(10 Marks)**

b. A centrifugal pump with radial inflow delivers 0.08 cumecs of water against a total head of 40m. If the outer diameter of the impeller is 30cm and its width at the outer periphery is 1.25 cm, find the blade angle at exit. The speed of the pump is 1500 rpm and its manometric efficiency is 80%. **(10 Marks)**

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CBCS SCHEME

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17CV/CT44

Fourth Semester B.E. Degree Examination, Aug./Sept.2020
Concrete Technology

Time: 3 hrs. Max. Marks: 100

Note: *1. Answer any FIVE full questions, choosing ONE full question from each module.*
2. Use of IS – 10262 mix design code is allowed.

Module-1

1 a. Define cement. Tabulates the oxides content. (04 Marks)
b. Explain the sulphate resisting cement and Portland slag cement. (06 Marks)
c. Explain the particle size distribution test of sand. (04 Marks)
d. Explain the tests flakiness and elongation index for coarse aggregate. (06 Marks)

OR

2 a. Explain the manufacture of cement in dry process by flow chart. (05 Marks)
b. Mention the field tests on cement. (05 Marks)
c. Explain the tests specific gravity and crushing value for coarse aggregate. (06 Marks)
d. What are the factor affects on size, shape and texture of aggregate. (04 Marks)

Module-2

3 a. Name the tests conducted on workability of concrete and explain any one test. (08 Marks)
b. Explain the process of manufacturing of concrete with flow charts. (12 Marks)

OR

4 a. What are the factors affecting workability. (08 Marks)
b. What is segregation and bleeding? How prevent in the concrete mix. (12 Marks)

Module-3

5 a. What is shrinkage of concrete? Explain drying shrinkage. (08 Marks)
b. Explain the penetration test according to IS456 codal provision. (04 Marks)
c. What are the factors improves the durability of concrete. (08 Marks)

OR

6 a. Define creep, what are the factors affecting the creep of concrete. (10 Marks)
b. Explain maturity concept. (04 Marks)
c. Explain the testing of hardened concrete. (06 Marks)

Module-4

7 a. Write a step by step procedure for concrete mix design according to IS code provision. (06 Marks)
b. Design a M30 grade concrete mix having a specific gravity of fine aggregate is 2.62 and grading zone I. Use IS : 10262 Indian standard recommended guidelines. Assume all other data suitable. (14 Marks)

OR

8 a. What are the data require for mix proportioning of concrete. **(04 Marks)**

b. Design a concrete mix design for a M40 grade using GGBS according to IS – 10262 code provision. Use following data :

a)	Type of cement	– OPC 43 grade
b)	Type of mineral admixture	– GGBS
c)	Maximum nominal size of A99	– 20mm
d)	Exposure condition	– Severe
e)	Workability	– 120mm (slump)
f)	Method of concrete placing	– Pumping
g)	Degree of supervision	– Good
h)	Maximum cement	– As per IS 456
i)	Type of aggregate	– Crushed stone angular aggregate
j)	Chemical admixture type	– Super plasticizer

Assume other data wherever necessary. **(16 Marks)**

Module-5

9 a. Explain the property of light weight concrete. **(06 Marks)**

b. What are the different types of fibers used in FRC? **(08 Marks)**

c. What are the factors on which property of RMC depends? **(06 Marks)**

OR

10 a. What are the properties of FRC? **(04 Marks)**

b. Name the different test conducted on self compacting concrete and explain any four. **(12 Marks)**

c. Write the application of light weight concrete mix. **(04 Marks)**

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CBCS SCHEME

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17CV45

Fourth Semester B.E. Degree Examination, Aug./Sept.2020
Basic Geotechnical Engineering

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) Void Ratio (ii) Porosity (iii) Air content (iv) Degree of saturation (v) Water content. **(05 Marks)**

b. Starting from 3-phase diagram, with usual notation prove that

$$r_d = \frac{(1-n_a)Gr_w}{1+GW}$$ **(07 Marks)**

c. A sample of soil has a volume of 1000 C.C and a weight of 17.5N. The specific gravity of soil solid 2.52. If dryout weight is 15.8 kN/m^3, determine the water content, void ratio, submerged unit weight and degree of saturation. **(08 Marks)**

OR

2 a. Briefly explain consistency limit and indices and explain activity of clay. **(08 Marks)**

b. The sample of sand above water table was found to have natural water content of 15% and unit weight of 18.484 kN/m^3. Laboratory test on a dry sample indicated e_{min} = 0.5 and e_{max} = 0.85 for densest and loosest state respectively. Compute the degree of saturation and relative density. Assume G = 2.65. **(06 Marks)**

c. Explain various correction factors in hydrometer analysis. **(06 Marks)**

Module-2

3 a. Explain the concept of electrical diffuse double layer. **(06 Marks)**

b. Mention three different clay mineral commonly found in soil. Explain any one with their structures. **(06 Marks)**

c. Differentiate between :
(i) Primary and secondary valency forces
(ii) Flocculated structures and dispersed structures. **(08 Marks)**

OR

4 a. State and explain briefly the factors affecting compaction of soil. **(06 Marks)**

b. Calculate the compactive energies applied for standard and modified proctor test. **(06 Marks)**

c. Following are the observations of compaction test:

Water content %	7.7	11.5	14.6	17.5	19.5	21.2
Weight of wet soil (N)	16.67	18.54	19.92	19.52	19.23	18.83

Volume of compaction mould = 950 cc

G = 2.65

(i) Draw compaction curve (ii) Report the MOD and OMC
(iii) Draw 100% saturation line. **(08 Marks)**

Module-3

5 a. With a neat sketch, explain the method of locating phreatic line for homogeneous earth dam with horizontal filter. **(06 Marks)**

b. Explain the following terms:
(i) total stress (ii) Neutral stress (iii) effective stress (iv) Quick sand condition. **(08 Marks)**

c. A 1.25m layer of soil, G = 2.65 and porosity = 35% is subject to an upward seepage head of 1.85m. What depth of coarse and would be required above the soil to provide a factor of safety of 2.0 against piping assuming that the coarse sand has same porosity and specific gravity as soil and that there is negligible headloss in the sand. **(06 Marks)**

OR

6 a. Briefly explain the factors affecting the permeability of soils. **(10 Marks)**

b. Derive an expression for coefficient of permeability used in variable head permeability test. **(10 Marks)**

Module-4

7 a. What is a pre-consolidation pressure? Explain the Casagrande's method of determining the pre-consolidation pressure from laboratory consolidation test. **(08 Marks)**

b. Write short note on pore water pressure in soils. **(06 Marks)**

c. A soil sample 20mm thick takes 20 minutes to reach 20% of consolidation. Find the time taken by for a clay layer 6m thick to reach 40% consolidation. Assume double drainage in both the cases. **(06 Marks)**

OR

8 a. With spring analogy, explain consolidation. **(10 Marks)**

b. A saturated soil has a compression index of 0.25. Its void ratio at a stress of 10 kPa is 2.02 and its permeability is 3.4×10^{-7} mm/s Compute.
(i) Change in void ratio if stress is increased to 19 kN/m^2
(ii) Settlement in (i) if he soil stratum is 5m thick
(iii) Time required for 40% consolidation if drainage is one way. **(10 Marks)**

Module-5

9 a. List the merit and demerits of triaxial shear test over Direct Shear test. **(08 Marks)**

b. Explain the classification of shear test based on drainage condition. **(06 Marks)**

c. In an unconfined compression test, a sample of sandy clay 8 cm long and 4 cm diameter fails under a load of 120 N at 10% strain. Compute the shearing resistance taking into account the effect of change in cross-section of the sample. **(06 Marks)**

OR

10 a. Explain Mohr-Coulomb failure theory of soil. **(06 Marks)**

b. What are factors affecting the shear strength of soil. **(06 Marks)**

c. In a shear test conducted on a river sand, the following result were obtained.

Normal force (N)	80	160	240	320	400	480
Shear force (N)	50	101	149	201	248	302

Determine 'C' and 'ϕ'. **(08 Marks)**

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CBCS SCHEME

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17CV46

Fourth Semester B.E. Degree Examination, Aug./Sept.2020
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 curve. Explain the Rankine's method of setting out simple circular curve. **(08 Marks)**

b. Two tangents intersect at chainage of 1190 mt, the deflection angle being 36°. Compute all the data necessary to set out a simple circular curve of radius 300 mt by deflection angle method. Take peg interval as 30 mt. Tabulate the results. **(12 Marks)**

OR

2 a. What is a Transition curve? List the function 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 300 mt and that of the second is 400 mt. Chainage of intersection point is 1500 mt. Calculate the chainages of tangent points and that of point of compound curvature. **(07 Marks)**

c. Two parallel railway lines are to be connected by a reverse curve of different radii. If the lines are 10 mt apart and the maximum distance between the tangent points measured parallel to the straight is 45 mt. Calculate the radius of the second branch, if that of first branch is 65 mt. Also calculate the length of both the branches. **(07 Marks)**

Module-2

3 a. Mention the points to be considered in the selection of triangulation stations. **(08 Marks)**

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

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

The station S and C are to the opposite sides at the line AB, calculate the correct angle ABC, if the lengths of AB and BC are 5276.5 and 4932.2 m respectively. **(12 Marks)**

OR

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

b. Find the most probable values of the angles, from the following given equations.

$A = 42° 36' 28''$ Weight 2
$B = 28° 12' 42''$ Weight 1
$C = 65° 25' 16''$ Weight 1
$A + B = 70° 49' 14''$ Weight 2
$B + C = 93° 37' 55''$ Weight 1 **(12 Marks)**

Module-3

5 a. Define the following terms:
(i) Celestial sphere (ii) Vertical circle (iii) The sensible horizon (iv) Zenith and Nadir **(08 Marks)**

b. Find the GMT corresponding to following LMT:
(i) 9 h 40 m 12s A.M at a place in Longitude 42° 36′ W
(ii) 4 h 32 m 10s A.M at a place in Longitude 56° 32′ E **(12 Marks)**

OR

6 a. Define the following terms:
(i) Celestial horizon (ii) The Altitude
(iii) The hour angle (iv) The prime vertical. **(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 LMT 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) Expose station
(iv) Oblique photograph **(08 Marks)**

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

OR

8 a. List the reasons for keeping overlap in photographs. **(06 Marks)**

b. Describe how mosaic differ from a map. **(04 Marks)**

c. A section line AB appears to be 10.16 cm on a photograph for which the focal length is 16 cm. The corresponding line measures 2.54 cm on a map which is to a scale of $1/50{,}000$.
The terrain has an average elevation of 200 m above MSL. Calculate the flying altitude at the aircraft, above MSL, when the photograph was taken. **(10 Marks)**

Module-5

9 a. What is GIS? List the applications of GIS in Civil Engineering. **(10 Marks)**

b. Explain the basic principle of GPS and its applications in civil engineering. **(10 Marks)**

OR

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

b. Define Remote Sensing. Explain the stages of idealized Remote Sensing. **(10 Marks)**

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CBCS SCHEME

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15CV42

Fourth Semester B.E. Degree Examination, Aug./Sept.2020
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. Define degree of freedom, give an example. **(03 Marks)**

b. Find the degree of static indeterminacy and kinematic indeterminacy for the structure shown in Fig.Q.1(b) (i) (ii) and (iii).

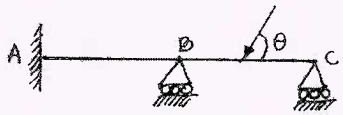


Fig.Q.1(b)(i)

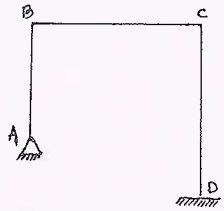


Fig.Q.1(b)(ii)

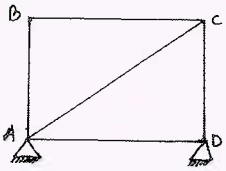
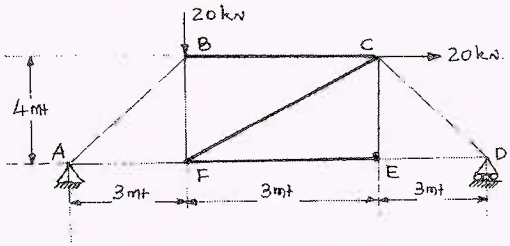


Fig.Q.1(b)(iii)

(06 Marks)

c. Determine the forces in the members BC, CF, FE by the method of sections as shown in Fig.Q.1(c). **(07 Marks)**

Fig.Q.1(c)

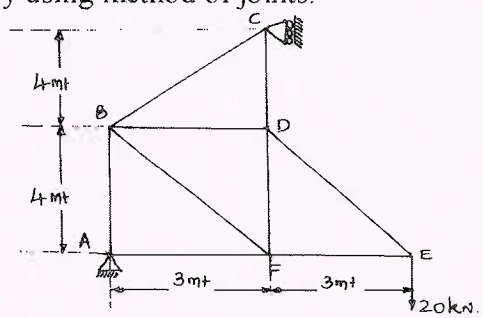


OR

2 a. What are the Assumptions made in the Analysis of trusses? **(04 Marks)**

b. Determine the magnitude and nature of forces in all the members of the pin-jointed plane truss shown in Fig.Q.2(b) by using method of joints. **(12 Marks)**

Fig.Q.2(b)



Module-2

3 a. Determine the slope at the supports and deflection at mid span of simply supported beam AB of length 'l' as shown in Fig.Q.3(a) by using double integration method. **(08 Marks)**

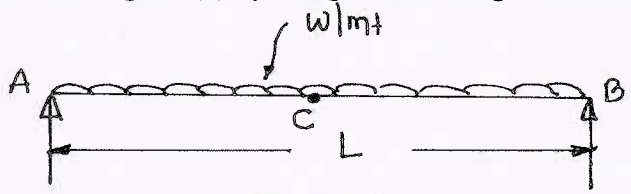


Fig.Q.3(a)

b. Determine the slope at supports and deflection at point load as shown in Fig.Q.3(b) by using Macaulay's method. **(08 Marks)**

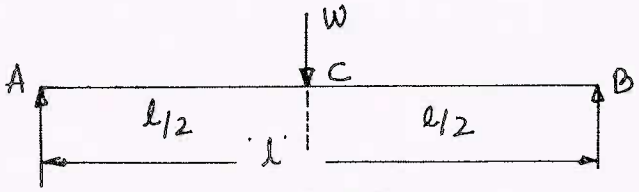


Fig.Q.3(b)

OR

4 a. Using the moment area method to determine the slope at its ends and deflection at point 'D' of simply supported beam as shown in Fig.Q.4(a). Take EI is 2×10^5 kN-m^2. **(08 Marks)**

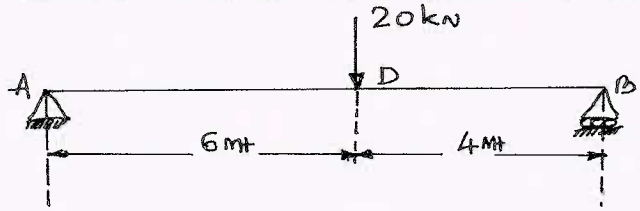


Fig.Q.4(a)

b. Find the slope at the supports and deflection under the load for the beam shown in Fig.Q.4(b). Take E = 2×10^5N/mm^2 and I = 5.13×10^8mm^4, by using conjugate beam method. **(08 Marks)**

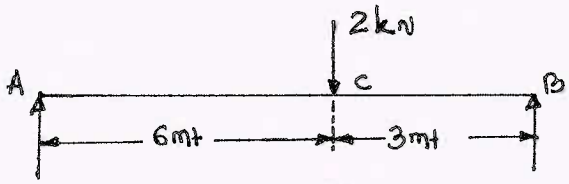


Fig.Q.4(b)

Module-3

5 a. Derive an expression for strain energy stored due to bending. **(08 Marks)**

b. Determine the deflection at the load point 'C' for the beam shown in Fig.Q.5(b) by using strain energy method. **(08 Marks)**

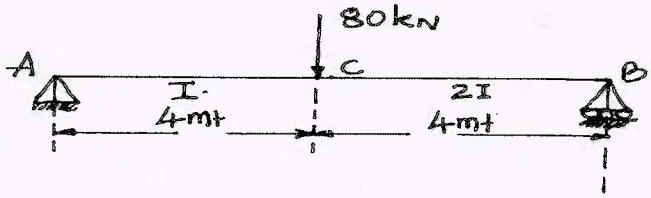


Fig.Q.5(b)

OR

6 a. State Castigliano's first and second theorems. **(04 Marks)**

b. Find the deflection under the concentrated load for the beam shown in Fig.Q.6(b). Using Castigliono's theorem and take $E = 2 \times 10^8 kN/m^2$ and $I = 14 \times 10^{-6} m^4$. **(12 Marks)**

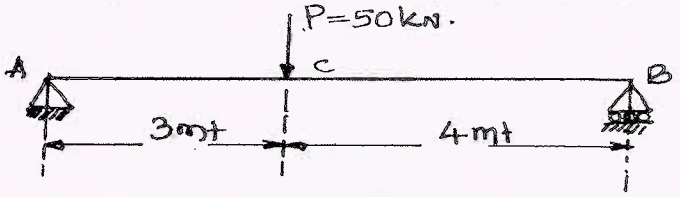


Fig.Q.6(b)

Module-4

7 A three hinged parabolic arch has a span of 30mt and central rise of 6mt. The arch carries a UDL of intensity 30kN/mt, over left half portion and a concentrated load of 60kN at 9mt from right hand support. Determine the bending moment, normal thrust, radial shear at 9mt from left hand support. **(16 Marks)**

OR

8 A cable is suspended between two points 'A' and 'B' 80mt apart horizontally and a central dip of 8mt. It supports a UDL of intensity 30kN/mt throughout its length. Calculate the maximum tension in the cable and length of the cable. Also determine the vertical force in the cable, if the back stay is inclined at 30° to the horizontal and the cable passes over smooth pulley. Supports are at the same level. **(16 Marks)**

Module-5

9 a. What is an influence line? And explain its importance in structural analysis. **(06 Marks)**

b. Determine the maximum bending moment at a section 5mt from the left support as shown in Fig.Q.9(b). **(10 Marks)**

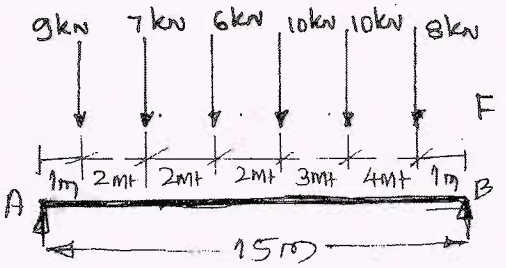


Fig.Q.9(b)

OR

10 Fig.Q.10 shows two wheel loads of 16kN and 18kN at a fixed distance apart of 2mt, cross a beam of 10mt span. Draw the influence line for bending moment and shear force for a point 4mt from the left abutment and find the maximum bending moment and shear force at that point. **(16 Marks)**

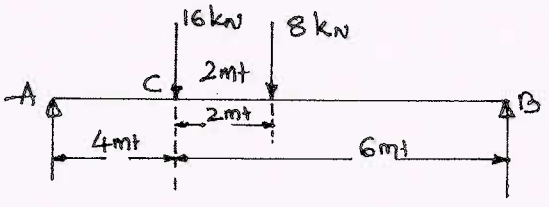


Fig.Q.10

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CBCS SCHEME

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15CV43

Fourth Semester B.E. Degree Examination, Aug./Sept. 2020
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. What do you understand by dimensional homogeneity in dimensional analysis? Explain with an example. **(04 Marks)**

b. For a laminar flow in a pipe, the drop in pressure ΔP is a function of the pipe length l, its diameter d, mean velocity of flow v and dynamic viscosity μ. Using Rayleigh's method develop the expression for ΔP. **(08 Marks)**

c. Define centre of buoyancy, Meta centre, Meta centric height and buoyancy. **(04 Marks)**

OR

2 a. Chezy's formula for velocity of flow V for uniform flow in a open channel is written as $V = C\sqrt{RS}$.
where R = Hydraulic mean radius, S = Slope of bed of channel. Find dimension of Chezy's constant C. **(04 Marks)**

b. Oil of density 917 kg/m^3 and dynamic viscosity = 0.29 PaS flows in a pipe of diameter 15 cm at a velocity of 2 m/sec. What would be the velocity of flow of water in a 1 cm diameter pipe, to make the flows dynamically similar? The density and viscosity of water can be taken as 998 kg/m^3 and 1.31×10^{-3} PaS respectively. **(04 Marks)**

c. A solid cylinder of diameter 30 cm and height 15 cm is to float in water with its axis vertical in sea water (SG = 1.03). If the relative density of the cylinder material is 0.9, examine the stability of the cylinder. **(08 Marks)**

Module-2

3 a. What size of a circular drainage pipe is needed to carry 1.10 m^3/sec of discharge when flowing half full? The pipe is laid at a slope of 0.0004 and Mannings n for the material of the pipe can be taken as 0.018. **(05 Marks)**

b. Draw the specific energy curve for flow through a channel and mark salient points on it. **(05 Marks)**

c. A rectangular channel 2 m wide carries a discharge of 6.0 m^3/sec. Calculate the critical depth, specific energy at critical depth and critical velocity. **(06 Marks)**

OR

4 a. A wide rectangular channel carries a flow of 2.76 m^3/sec per metre width, the depth of flow being 1.524 m. Calculate the Critical depth, Velocity, Froude number and check type of flow. **(06 Marks)**

b. A trapezoidal channel with side slopes of 2H : 1 V has to be designed to carry 15 m^3/sec at a slope of 1/5000. Determine the dimensions of the most efficient section. Assume Manning's $\eta = 0.014$. **(08 Marks)**

c. State the conditions for a most economical rectangular channel section. **(02 Marks)**

Module-3

5 a. If in a hydraulic Jump occurring in a horizontal rectangular channel, the Froude's number before jump is 10.0 and energy loss is 3.20 m. Estimate the (i) Sequent depths (ii) The discharge intensity (iii) Froude's number after jump. **(08 Marks)**

b. Derive an expression for loss in head due to hydraulic jump. **(05 Marks)**

c. Briefly explain different types of slopes in a gradually varied flow in a channel section. **(03 Marks)**

OR

6 a. Derive the dynamic equation for a gradually varied flow in an open channel flow with usual notations. **(08 Marks)**

b. Water flows in a triangular channel of side slope 1 H : 1 V and longitudinal slope of 0.001. Determine whether the flow is mild, steep or critical when a discharge of 0.2 m^3/sec flows through it. Assume Manning's $\eta = 0.015$. For what range of depths will the flow be of type 1, 2 or 3? **(08 Marks)**

Module-4

7 a. A Pelton wheel is working under a head of 45 m and the discharge is 0.8 m^3/sec. The mean bucket speed is 14 m/sec. Find the overall efficiency and power produced if the Jet is deflected by the blades through an angle of 165°. Assume coefficient of velocity = 0.985 and mechanical efficiency $\eta_m = 0.95$. **(08 Marks)**

b. Derive an expression for a Jet striking a series of moving curved vanes at centre. Also find the condition for maximum efficiency of jet and maximum efficiency. **(08 Marks)**

OR

8 a. Give brief descriptions of classification of turbines. **(04 Marks)**

b. A Jet of water having a velocity of 45 m/sec impinges without shock on a series of vanes moving at 15 m/sec. The direction of motion of vanes being inclined at 20° to that of the jet. The relative velocity at outlet is 0.9 of that at inlet, and absolute velocity of water at exit is to be normal to motion of vanes. Find

(i) Vane angles at entrance and exit.

(ii) Workdone on vanes per unit weight of the water supplied by the jet.

(iii) The hydraulic efficiency. **(08 Marks)**

c. State and explain impulse momentum equation. **(04 Marks)**

Module-5

9 a. A Kaplan turbine produces 60000 kW under a net head of 25 m with an overall efficiency of 90%. Taking the value of speed ratio as 1.6 and flow ratio as 0.5 and hub diameter as 0.35 times the outer diameter, find the diameter and speed of turbine. **(08 Marks)**

b. What is a draft tube? List the functions of draft tube. Explain different types of draft tube with appropriate diagram. **(08 Marks)**

OR

10 a. With a neat diagram, explain principle, components and working of centrifugal pumps. **(08 Marks)**

b. A centrifugal pump has the following characteristics: Outer diameter of impeller = 800 mm. Width of impeller at outlet = 100 mm. Angle of impeller at outlet = 40°. The impeller runs at 550 rpm and delivers 0.98 m^3/sec of water under an effective head of 35 m. A 500 kW is motor is used to drive the pump. Determine manometric, mechanical and overall efficiencies of the pump. Assume water enters the impeller vanes radially at inlet. **(08 Marks)**

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CBCS SCHEME

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15CV45

Fourth Semester B.E. Degree Examination, Aug./Sept.2020
Basic Geotechnical Engineering

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Differentiate between : i) Water content and degree of saturation. ii) Air content and percentage air voids iii) Specific gravity and mass specific gravity. **(06 Marks)**

b. With usual notations, derive the relation $\gamma = \frac{(G+Se)\gamma_w}{1+e}$. **(04 Marks)**

c. A saturated soil has a total volume of 130CC, total mass of 240g and oven dry mass of 180g. using fundamentals, calculate i) Water content ii) Specific gravity of soil solids and iii) Voids ratio of soil. **(06 Marks)**

OR

2 a. What are the three corrections to be applied to the hydrometer reading in the sedimentation analysis? Explain briefly. **(06 Marks)**

b. With a neat sketch, explain the use of 'Plasticity chart' in classifying the fine grained soils as per Indian standards. **(05 Marks)**

c. A soil has particles 86% finer than 4.75mm 7% finer than 75 microns, $C_u = 6.8$, $C_c = 1.4$. Liquid limit = 60% , Plastic limit = 25%. Classify the soil as per I.S. **(05 Marks)**

Module-2

3 a. Explain the clay minerals – Kaolinite and Montmorillonite using neat sketches of their structures. **(06 Marks)**

b. The data from a standard compaction test on a soil is given below :

Water Content %	8.5	12.2	13.75	15.5	18.2	20.2
Bulk Unit weight γ kN/m^3	17.64	19.0	19.6	20.09	19.89	19.4

i) Plot the compaction curve and determine OMC and MDD.
ii) Determine the degree of saturation at OMC.
iii) What is the range of water content to be used in field to achieve 95% relative compaction? **(10 Marks)**

OR

4 a. What are the factors affecting compaction? Explain any two of them. **(06 Marks)**

b. Compare I.S Light compaction test and I.S Heavy compaction test. **(04 Marks)**

c. A highway embankment is required to be constructed with a bulk unit weight of 20.34kN/m^3 at a water content of 13% for a total volume of 8000m^3. How much soil is required from a borrow pit which has a bulk unit weight of 19kN/m^3 and water content of 8%. Also calculate the extra water to be added. **(06 Marks)**

Module-3

5 a. State the Darcy's law along with the assumptions used. **(06 Marks)**

b. Derive the formula to determine the coefficient of permeability in falling head permeability test. **(06 Marks)**

c. During a variable head permeability test the water head dropped from 120cm to 100cm in 4 minutes. What would be the water head after another 4 minutes? **(04 Marks)**

OR

6 a. What are the characteristics of flow – net? **(04 Marks)**

b. Derive the formula to calculate seepage loss through isotropic soil below a concrete dam. **(06 Marks)**

c. The soil profile at a site is shown in the figure below. Calculate and draw the variation of σ, u and σ'. **(06 Marks)**

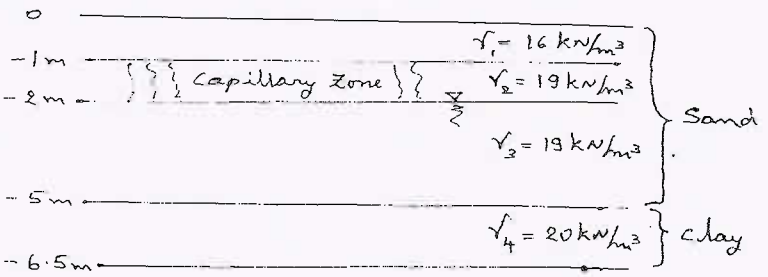

Fig.Q6(c)

Module-4

7 a. Define the following : i) N.C clay ii) O.C clay and iii) U.C clay. **(06 Marks)**

b. Explain with neat sketches the "Square Root of time method" to determine the coefficient of consolidation in the laboratory. **(06 Marks)**

c. A clay specimen 20mm thick has reached 50% consolidation in 6 hours under double drainage. What will be the time taken for the same clay in the field to reach 90% consolidation under double drainage , if the clay layer is 2m thick. **(04 Marks)**

OR

8 a. Differentiate between the following :

i) Compression Index and Coefficient of consolidation.

ii) Coefficient of compressibility and coefficient of volume compressibility. **(04 Marks)**

b. What is Pre – consolidation pressure? How is it determined by Casagrande's method? **(06 Marks)**

c. Calculate the primary consolidation settlement of the clay layer shown in the fig.Q8(c) , if the increase in effective stress is $15kN/m^2$ at the centre of clay layer. **(06 Marks)**

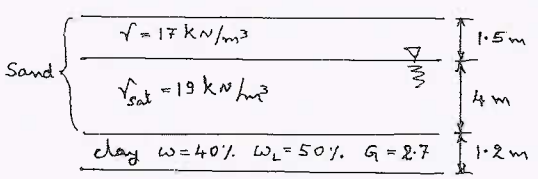

Fig.Q8(c)

Module-5

9 a. Derive the relation between major and minor principal stresses in a Triaxial test with a neat sketch. **(06 Marks)**

b. The data from direct shear tests on a soil are given below. Shear box has internal dimensions of 60mm × 60mm. Plot the graph and determine the shear parameters. If the same soil is tested in Triaxial compression with a cell pressure of $100kN/m^2$, what will be σ_1 at failure? **(10 Marks)**

Normal load (KN)	100	200	300
Shear force at failure (KN)	90	181	270

OR

10 a. What are the advantages and disadvantages of Direct shear test compared to Triaxial test? **(06 Marks)**

b. Consolidated undrained tests were done on a soil. Given the following data , determine the shear strength parameters based on : i) Total stresses and ii) Effective stresses. **(10 Marks)**

Cell pressure (kN/m^2)	150	300
Diameter stress at failure (kN/m^2)	102	200
Pore water pressure (kN/m^2)	80	156

CBCS SCHEME

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15CV/CT32

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Strength of Materials

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. State Hooke's law. Derive the expression for change in length of bar using Hooke's law. **(04 Marks)**

b. A steel bar of 25 mm diameter is acted upon by forces as shown in Fig. Q1 (b). Determine the total extension of the bar. $E = 2\times10^5$ N/mm^2. **(06 Marks)**

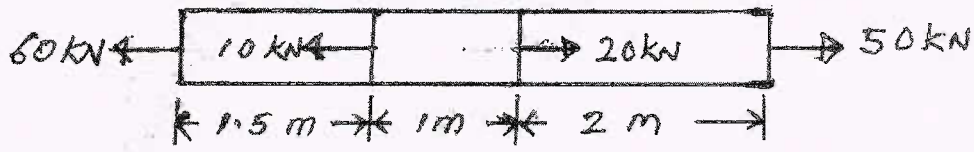

Fig. Q1 (b)

c. The Bronze bar 3 m long with 320 mm^2 cross sectional area is placed between two rigid walls at -20°C. There is a gap $\Delta = 2.5$ mm as shown in Fig. Q1 (c). Find the magnitude and the type of stress induced in the bar when it is heated to a temperature of 50.6°C. For bronze bar take $\alpha_b = 18\times10^{-6}/^\circ$C and $E_b = 80$ GPa. **(06 Marks)**

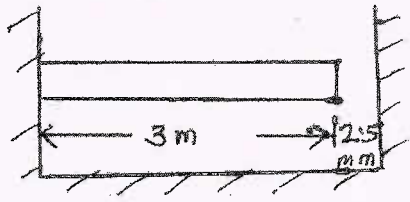

Fig. Q1 (c)

OR

2 a. Derive the relation between modulus of elasticity and modulus of rigidity. **(06 Marks)**

b. Find the total elongation of the bar shown in Fig. Q2 (b) subjected to an axial tensile force of 50 KN on the bar of material having modulus of elasticity = 2.1×10^5 N/mm^2. **(04 Marks)**

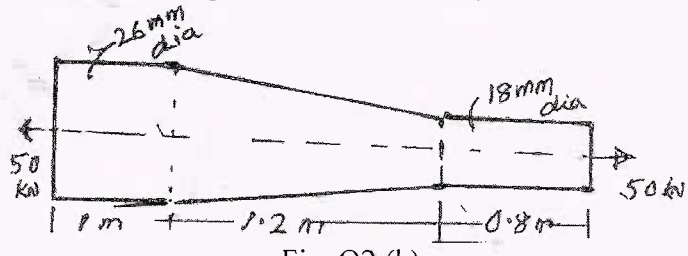

Fig. Q2 (b)

c. A copper rod, 25 mm in diameter is enclosed in steel tube 30 mm internal diameter and 35 mm external diameter. The ends are rigidly attached. The composite bar is 500 mm long and is subjected to an axial pull of 30 KN. Find the stresses induced in the rod and the tube. Take E for steel = 2×10^5 N/mm^2 and E for copper as 1×10^5 N/mm^2. **(06 Marks)**

Module-2

3 a. State principal stresses and principal planes. **(04 Marks)**

b. An element is subjected to stresses as shown in Fig. Q3 (b). Find out stresses on inclined plane AB by Mohr's graphical method. **(06 Marks)**

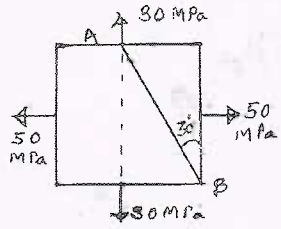

Fig. Q3 (b)

c. A point in a strained material is subjected to the stresses as shown in Fig. Q3 (c). Locate the principal stresses. Also determine the maximum shear stress. Use analytical approach. **(06 Marks)**

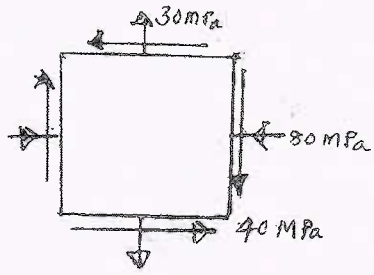

Fig. Q3 (c)

OR

4 a. Differentiate thick and thin cylinders. **(04 Marks)**

b. A cylindrical shell has an external diameter of 500 mm and wall thickness 10 mm. The length of the cylinder is 1.7 m. Determine the increase in its internal diameter and length when inside pressure is 1 N/mm^2. Given E = 210 GPa and Poisson's ratio = 0.3 **(06 Marks)**

c. Draw the radial and hoop stress distribution diagram over the wall of a thick cylinder. The outside diameter of pipe is 150 mm while inside diameter is 70 mm. The pipe is subjected to internal and external pressures 6 MPa and 4 MPa respectively. **(06 Marks)**

Module-3

5 a. Draw SFD and BMD for a simply supported beam carrying udl of intensity ω/m over the entire length. **(04 Marks)**

b. Draw SFD and BMD for a overhanging beam loaded as shown in Fig. Q5 (b). Indicate all salient features. **(12 Marks)**

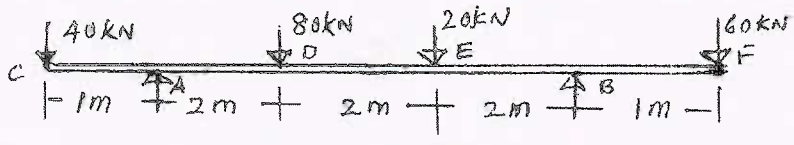

Fig. Q5 (b)

OR

6 a. Derive the relation between load, shear force and bending moment. **(04 Marks)**

b. From the given shear force diagram, shown in Fig. Q6 (b) develop the load diagram and draw BMD. Also determine points of contraflecture if any. **(12 Marks)**

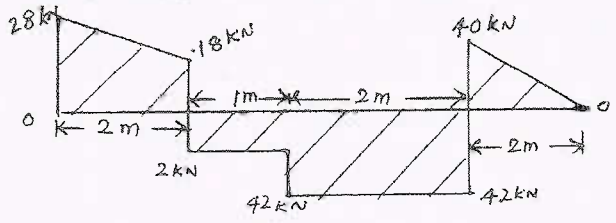

Fig. Q6 (b)

Module-4

7 a. State the assumptions made in theory of pure bending. Derive bending equation $\frac{M}{I} = \frac{f}{Y} = \frac{E}{R}$ with usual notations. **(06 Marks)**

b. A beam with an I section consists of 180mm × 15mm flanges and a web of 280 mm deep and 15 mm thickness. It is subjected to a bending moment of 120 KN-m and a shear force of 60 kN. Sketch the bending and shear stress distribution along the depth of the section. Refer Fig. Q7 (b). **(10 Marks)**

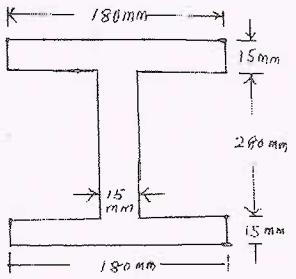

Fig. Q7 (b)

OR

8 a. Derive Euler's expression for buckling load on column with both ends pinned. **(06 Marks)**

b. Design the section of a circular cast iron column to carry a load of 1000 KN. The length of the column is 6 m. Use Rankine's constant $\frac{1}{1600}$ and factor of safety of 3. One end of the column is fixed and other is free. Critical stress is 560 MPa. **(10 Marks)**

Module-5

9 a. With torsional equation explain the following terms :

(i) Torsional rigidity.

(ii) Torsional stiffness. **(04 Marks)**

b. With usual notations derive the equation for torsion. **(06 Marks)**

c. A hollow shaft has outer diameter 100 mm and inner diameter 70 mm. Calculate shear stress acting on elements at the outer and inner surfaces, respectively, due to a torque of 7000 N-m. Draw sketch showing how the shear stress vary in magnitude along a radial line. **(06 Marks)**

OR

10 a. Explain the following theories of failure:

(i) St. Venant's theory.

(ii) Tresca's theory. **(08 Marks)**

b. At a point in a steel member the major principal stress is 200 MN/m^2 and the minor principal stress is compressive. If the tensile yield point of the steel is 250 MN/m^2, find the value of the minor principal stress at which yielding will commence, according to each of the following criteria of failure,

(i) Maximum shearing stress.

(ii) Maximum total strain energy.

(iii) Maximum shear strain energy.

Poisson's ratio = 0.28 **(08 Marks)**

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CBCS SCHEME

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15CV33

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Fluid Mechanics

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Define the following terms. Mention their units and dimensions.
(i) Mass density (ii) Weight density (iii) Specific volume (iv) Specific gravity **(08 Marks)**

b. A U tube manometer is used to measure the pressure of oil of specific gravity 0.85 flowing in a pipe line. Its left end is connected to the pipe and right limb is open to atmosphere. The center of the pipe is 100 mm below the level of mercury (Sp.Gr = 13.6). In the right limb. If the difference of mercury levels in the right limb and left limb is 160 mm, determine the absolute pressure of oil in the pipe. **(08 Marks)**

OR

2 a. State and prove Pascal's law. **(08 Marks)**

b. A 400 mm shaft is rotating at 200 rpm in a bearing of length 100 mm. If the thickness of the oil film is 1.4 mm and the dynamic viscosity of the oil is 0.7 N-S/m^2. Determine
(i) Torque required to overcome friction in bearing.
(ii) Power utilized in overcoming viscous resistance.
Assume a linear velocity profile. **(08 Marks)**

Module-2

3 a. Derive an expression for total pressure on one side of an inclined plane and show that the center of pressure lies lower than its centroid. **(08 Marks)**

b. If for a two dimensional potential flow, the velocity potential is given by $\phi = x(2y-1)$. Determine the velocity at the point P(4, 5). Determine also the value of stream function ψ at the point P. **(08 Marks)**

OR

4 a. Obtain an expression for continuity equation in three dimensional form. **(08 Marks)**

b. A vertical Gate closes a horizontal tunnel 5 m high and 3 m wide running full with water. The pressure at the bottom of the gate is 196.20 kN/m^2. Determine the total pressure on the gate and position of the centre of pressure. **(08 Marks)**

Module-3

5 a. Obtain Euler's equation of motion along a stream tube and hence derive Bernoulli's equation. List out the assumptions made. **(08 Marks)**

b. A horizontal venutrimeter with inlet diameter of 25 cm and throat diameter of 15 cm is used to measure. The flow of water. The pressure at the throat is 30 cm of mercury (vaccum) and that at the inlet is 200 KN/m^2 (gauge). Find the discharge of water through the meter. Take $C_d = 0.98$. **(08 Marks)**

OR

6 a. Derive the equation for the discharge through venturimeter. List out the assumptions made. **(08 Marks)**

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

Module-4

7 a. Define various hydraulic coefficients of an orifice and derive the relation for discharge through an orifice. **(08 Marks)**

b. A rectangular notch 40 cm long is used for measuring a discharge of 30 lps. An error of 1.5 mm was made while measuring the head over the notch. Calculate the percent error in the discharge $C_d = 0.6$ **(08 Marks)**

OR

8 a. Derive an expression for discharge over a triangular notch. **(08 Marks)**

b. A rectangular orifice 1.5 m wide and 1.0 m deep is discharging water form a tank. If the water level in the tank is 3 m above the top edge of the orifice, find the discharge through the orifice. Take $C_d = 0.6$ **(08 Marks)**

Module-5

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

b. A compound piping system consists of 1800 m of 0.5 m, 1200 m of 0.4 m and 600 m of 0.3 m new cast iron pipes connected in series. Convert the system to,

(i) An equivalent length of 0.4 m pipe.

(ii) Equivalent size pipe 3600 m long. **(08 Marks)**

OR

10 a. 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 assuming the pipe is elastic, given $E = 200\ GN/m^2$, Poisson's ratio 0.25 and K for water = $2\ GN/m^2$, pipe wall is 5 mm thick. **(08 Marks)**

b. Write short notes on: (i) Minor losses in pipe flow (ii) Hardy cross method (iii) Water hammer in pipes. **(08 Marks)**

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