

GBCS SCHEME

USN

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|

15CV71

Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020 Municipal and Industrial Wastewater Engineering

Time: 3 hrs.

Max. Marks: 80

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

Module-1

- 1 a. Explain briefly the different types of sewerage system. (06 Marks)
b. Explain the various factors affecting the dry weather flow. (04 Marks)
c. The drainage area of one sector of a town is 20 hectares. The classification of the surface of this area is as follows :

| % Total surface area | Type of surface | Run – off coefficient |
|----------------------|-------------------|-----------------------|
| 25 | Hard pavements | 0.85 |
| 25 | Roof surface | 0.80 |
| 15 | Unpaved street | 0.30 |
| 25 | Gardens and Lawns | 0.15 |
| 10 | Wooded area | 0.10 |

If the time of concentration for the area is 30 minutes. Find the maximum run off. Use the following formula for intensity of rainfall $R = 900/(t + 60)$. (06 Marks)

OR

- 2 a. Briefly explain the essential requirements of a good sewer material. (04 Marks)
b. Explain with a neat sketch, working of an “oxidation pond”. (06 Marks)
c. Explain with a neat sketch, construction and working of a manhole. (06 Marks)

Module-2

- 3 a. Briefly explain self cleaning velocity and non scouring velocity. (04 Marks)
b. State the hydraulic formulas for velocity which are commonly adopted in the design of sewers. Explain any one in brief. (06 Marks)
c. A stone – ware sewer having 30cm in diameter is laid at a gradient of 1 in 100 use $N = 0.013$ in Manning’s formula. Calculate the velocity, discharge and Chezy’s co-efficient when the sewer is running full. (06 Marks)

OR

- 4 a. Explain the phenomenon of self – purification of natural streams subjected to pollution with the help of oxygen – sag curve indicating the salient features. (10 Marks)
b. The sewage of a town is to be discharged into a river. The quantity of sewage produced per day is 8 million liters and its BOD is 250 mg/l. If the discharge in the river is 200 l/s and if its BOD is 6mg/l, find the B.O.D of the diluted water. (06 Marks)

Module-3

- 5 a. Write the flow diagram employed to treat municipal waste water and indicate the importance of each treatment unit. (08 Marks)
b. With a neat sketch, explain the working of a grit chamber and skimming tank. (08 Marks)

1 of 2

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

OR

- 6 a. Explain with a neat sketch, the working principles of a trickling filter. (08 Marks)
b. Briefly explain the terms : i) Suspended growth ii) Activated sludge
iii) Sludge digester iv) Sequential batch reactors. (08 Marks)

Module-4

- 7 a. Explain the effects of effluent discharge on the stream water quality. (08 Marks)
b. What is meant by strength reduction? Explain the various methods of strength reduction being adopted in the industries. (08 Marks)

OR

- 8 a. List and explain the methods of removal of colloidal solids from wastewater. (08 Marks)
b. Explain the principles of raw and partially treated wastes before discharged into streams. (08 Marks)

Module-5

- 9 a. With the help of a flow diagram, explain the treatment units suggested to treat wastewater from a tanning industry along with wastewater characteristics. (08 Marks)
b. State the sources and characteristics of the wastewater from dairy industry. (08 Marks)

OR

- 10 a. With the help of a line diagram, explain the process of paper and pulp industry highlighting the sources of wastewater generation. (08 Marks)
b. Discuss the characteristics and treatment of waste water from a pharmaceutical industry. (08 Marks)

* * * * *

USN

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|

15CV72

Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020 Design of RCC and Steel Structures

Time: 3 hrs.

Max. Marks: 80

- Note: 1. Answer any TWO full questions, choosing ONE full question from each module.
2. Use of IS456, IS800, SP(6)-Steel Table is permitted.
3. Assume any missing data suitably.*

Module-1

- 1 Design a reinforced concrete combined rectangular slab footing for two columns located at 4.5 m apart. The overall sizes of the columns are 400mm × 400mm and 600mm × 600mm and they are transferring 600 kN and 1000 kN respectively. The centre of the lighter column is 0.4m from the property line. The safe bearing capacity of the soil 150 kN/m². Use M20 concrete and Fe 415 steel. Sketch the reinforcement details. (40 Marks)

OR

- 2 Design a cantilever retaining wall to retain an earth embankment with a horizontal top 3.5m above ground level. Density of earth 18 kN/m³, angle of internal friction $\phi = 30^\circ$. SBC of soil is 200 kN/m³. Take coefficient of friction between soil and concrete 0.5. Adopt M20 grade concrete and Fe 415 steel. (40 Marks)

Module-2

- 3 The centre line of a roof truss is as shown in the Fig.Q3. The forces in the members of the truss due to dead load, live load and wind load is given below: Design the roof truss member using M16 bolts of property class 4.6. Also design a bearing plate and anchor bolts for a pull of 40 kN. Use M20 grade concrete. Draw to suitable

(i) Elevation of truss greater than half space (ii) Support details.

| Member | DL (kN) | LL (kN) | WL (kN) |
|--------|---------|---------|---------|
| AB | + 14.37 | + 21.80 | - 37.32 |
| BC | + 11.64 | + 17.60 | - 32.08 |
| CD | + 12.05 | + 18.26 | - 35.90 |
| DE | - 5.13 | - 7.70 | + 14.70 |
| EC | + 2.77 | + 4.18 | - 8.42 |
| EB | + 2.77 | + 4.18 | - 9.15 |
| EA | - 12.85 | - 19.36 | + 31.69 |
| EF | - 7.69 | - 11.61 | + 15.63 |

Sign :- + ⇒ Compression
- ⇒ Tension

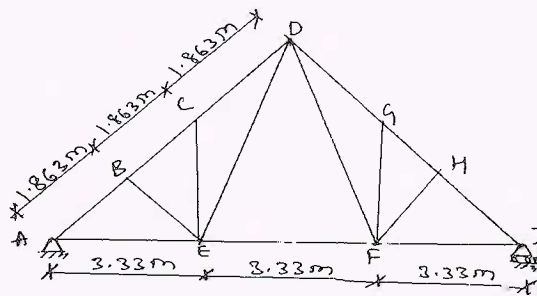


Fig.Q3

(40 Marks)

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

OR

4 Design a simply supported gantry girder to carry an electrically operated travelling crane with the following details:

- (i) Span of the crane bridge \Rightarrow 25 m
- (ii) Span of the gantry girder \Rightarrow 8 m
- (iii) Wheel base \Rightarrow 3.5 m
- (iv) Crane capacity \Rightarrow 200 kN
- (v) Weight of crane bridge \Rightarrow 150 kN
- (vi) Weight of trolley (crab) \Rightarrow 75 kN
- (vii) Minimum hook distance \Rightarrow 1.0 m
- (viii) Weight of rail \Rightarrow 0.30 kN/m
- (ix) Height of rail \Rightarrow 105 mm

Draw neatly cross section of gantry girder showing all details. Also draw side view.

(40 Marks)

* * * * *

CBCS SCHEME

USN

| | | | | | | | | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|

15CV73

Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020 Hydrology and Irrigation Engineering

Time: 3 hrs.

Max. Marks: 80

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

Module-1

- 1 a. With a neat sketch, explain the Engineering representation of the Hydrologic cycle. (08 Marks)
 b. Briefly explain with a neat sketch, the i) Moving average curve ii) Mass curve
 iii) Rainfall hyetograph iv) Forms of precipitation. (08 Marks)

OR

- 2 a. With a Table, explain Global and Indian water availability. (05 Marks)
 b. Write a note on optimum number of rain gauge stations. (05 Marks)
 c. The average annual rainfall of 8 rain gauge stations in a basin are 1000, 950, 900, 850, 800, 700, 600, 400 mm. If the permissible error is 6%. Determine the optimum number of rain gauges required in the basin. (06 Marks)

Module-2

- 3 a. Explain what is evapo – transpiration and also factors affecting evapo – transpiration. (08 Marks)
 b. Describe how the estimation of evaporation is carried by
 i) Meyer’s equation ii) Rohwer’s equation. (08 Marks)

OR

- 4 a. Describe the method of determining infiltration capacity using a double ring infiltrometer. (06 Marks)
 b. A reservoir with average surface spread of 4.8 km² in the first week of November has the water surface temperature of 30⁰C and relative humidity of 40%. Wind velocity measured at 3.0m above the ground is 18km/h. The mean barometer reading is 760mm of Hg. Calculate the average evaporation loss from the reservoir in mm/day and the total depth and volume of evaporation loss in the first week of November. Use both Meyer’s equation as well as Rohwer’s equation. Take saturation vapour pressure at 30⁰C as 31.81mm of Hg. (10 Marks)

Module-3

- 5 a. Define Runoff. Explain the factors affecting Runoff. (05 Marks)
 b. Explain with a neat sketch, components of storm hydrograph. (05 Marks)
 c. Find the ordinates of a flood hydrograph resulting from a storm with rainfalls of 2.50 , 6.85 and 3.75cm each during success –ve 3 hours. The ordinates of a 3 hour UHG are given below. Assume an initial loss of 5mm – infiltration index , $\phi = 2.5$ mm/hr , Base flow = 12 cumec.

| | | | | | | | | | | | | | | | | |
|-----------------------|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|----|----|----|----|----|
| Time (hours) | 3 | 6 | 9 | 12 | 15 | 18 | 21 | 24 | 3 | 6 | 9 | 12 | 15 | 18 | 21 | 24 |
| UHG ordinates (cumec) | 0 | 115 | 370 | 510 | 395 | 315 | 252 | 231 | 112 | 127 | 96 | 64 | 43 | 25 | 12 | 0 |

(06 Marks)

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

OR

- 6 a. Explain Rainfall – Runoff correlation analysis. (04 Marks)
 b. Define Unit Hydrograph. Explain with a neat sketch, the derivation of unit Hydrograph. State its assumption, application and limitations. (08 Marks)
 c. Given the ordinates of a 4 – h unit hydrograph as below derive the ordinates of a 12 – h unit hydrograph for the same catchment. (04 Marks)

| | | | | | | | | | | | | |
|--|---|----|----|-----|-----|-----|----|----|----|----|----|----|
| Time (hr) | 0 | 4 | 8 | 12 | 16 | 20 | 24 | 28 | 32 | 36 | 40 | 44 |
| Ordinates of 4h UH (m ³ /sec) | 0 | 20 | 80 | 130 | 150 | 130 | 90 | 52 | 27 | 15 | 05 | 0 |

Module-4

- 7 a. with neat sketches. Explain Band hara Irrigation. List its advantages and disadvantages. (06 Marks)
 b. Define Irrigation. What are the necessity of irrigation? (05 Marks)
 c. Explain the various irrigation efficiencies. (05 Marks)

OR

- 8 a. Explain with neat sketch, the variation of Duty with the places of its measurement. (06 Marks)
 b. What are the different methods adopted to improve duty of water? (05 Marks)
 c. With a neat sketch, explain different systems of irrigation. (05 Marks)

Module-5

- 9 a. Write a note on Canal classification. (04 Marks)
 b. Briefly explain the Lacey's Regime theory. (06 Marks)
 c. Write with a neat sketch, the calculation of Reservoir capacity for a specified yield from the mass inflow curve. (06 Marks)

OR

- 10 a. Define the following : i) Gross command area ii) Cultural command area
 iii) Crop factor iv) Time factor. (04 Marks)
 b. Explain with a neat sketch, zones of storage in a Reservoir. (04 Marks)
 c. A channel section has to be designed for the following data :

Discharge $Q = 30$ cumes ; Silt factor $f = 1.00$; Side slope = $\frac{1}{2} : 1$.

Find also the longitudinal slope.

(08 Marks)

* * * * *

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|

Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020

Design of Bridges

Time: 3 hrs.

Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.

2. Use of codes IRC-6, IRC-21, IRC-112, IS-456, SP-16 and Pigeaud's curves are permitted.

Module-1

- 1 a. Classify bridges based on various parameters. (10 Marks)
b. What are the different types of loads acting on a bridge? (06 Marks)

OR

- 2 a. What is meant by economic span? Derive the expression for economic span. (08 Marks)
b. Determine the linear waterway for a bridge across a stream with a flood discharge of $200 \text{ m}^3/\text{s}$, velocity 1.4 m/s and width of flow at high flood level 52.0m , if the allowable velocity under the bridge is 1.75 m/s . (08 Marks)

Module-2

- 3 A reinforced concrete slab bridge has a clear span of 5.5m and has the following data:
Width of bearing on either side = 500 mm
Clear width of carriage way = 7.5 m
Width of footpath on either side = 1.0 m
Wearing coat thickness = 80 mm
Live load expected – Class AA tracked vehicle
Grade of concrete = M30
Grade of Steel = Fe 415
Design and detail the slab bridge. (16 Marks)

OR

- 4 a. What is meant by a skew slab bridge? (02 Marks)
b. What are the differences between a straight slab bridge and a skew slab bridge? (06 Marks)
c. Sketch typical reinforcement detailing of skew slab bridges. (08 Marks)

Module-3

- 5 Design and detail the interior slab of a T-beam bridge with the following data:
Spacing of longitudinal main girders = 3.0 m
Spacing of cross girders = 3.75 m
Thickness of deck slab = 200 mm
Thickness of wearing coat = 80 mm
Live load = Class AA, tracked vehicle
Grade of concrete = M30
Grade of steel = Fe415 (16 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 4.2-1.8 = 50, will be treated as malpractice.

CBCS SCHEME

USN

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|

15CV742

Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020 Groundwater and Hydraulics

Time: 3 hrs.

Max. Marks: 80

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

Module-1

- 1 a. With a neat sketch, explain the vertical distribution of Ground water. (08 Marks)
b. Explain in brief the occurrence of Ground water in different types of rocks and soils. (08 Marks)

OR

- 2 a. Explain the importance of Ground water. (08 Marks)
b. What is an aquifer? Explain different types of Aquifers, with a neat sketch. (08 Marks)

Module-2

- 3 a. Define Specific yield, Specific retention and Porosity. Derive a relationship between them. (08 Marks)
b. It is observed in a field test that 3 hr 20 min was required for a tracer to travel from one well to another 20m apart and the difference in their water surface elevations was 0.5m. Samples of the aquifer between the wells indicated a porosity of 15%. Determine the permeability of the aquifer, seepage velocity and the Reynolds number for the flow assuming an average grain size of 1mm and kinematic viscosity of water at 27°C is 0.008 stoke. (08 Marks)

OR

- 4 a. With a neat sketch, explain Darcy's law, discuss its validity and limitations. (08 Marks)
b. Derive an expression for one dimensional steady flow in a homogeneous unconfined aquifer. (08 Marks)

Module-3

- 5 a. What are the assumptions made in Theis's method? Explain Theis's method to determine formation constants T and S for unsteady radial flow towards a well. (06 Marks)
b. Derive the discharge equation for steady radial flow into a well in a confined aquifer. (06 Marks)
c. A tube well of 30cm diameter penetrates fully in an artesian aquifer. The strainer length is 15m. Calculate the yield from the well under a drawdown of 3m. The aquifer consists of sand of effective size of 0.2mm having a coefficient of permeability equal to 50m/day. Assume a radius of drawdown equal to 150 meters. (04 Marks)

OR

- 6 a. Explain Cooper Jacob methods of solutions for unsteady radial flow in a confined aquifer. (08 Marks)
b. A 30 cm well penetrates 49.99m below the static water table. After a long period of pumping at a rate of 1799 lpm, the drawdown in the wells at 15 and 44.99m from the pumped well were 1.69 and 0.79m respectively. Determine the transmissibility of the aquifer. What is the drawdown in the pumped well? (08 Marks)

Module-4

- 7 a. Explain with a neat sketch, the Electrical resistivity (surface) method for ground water exploration. (08 Marks)
b. Explain the Sonic logging with equation. (08 Marks)

OR

- 8 a. Explain with a neat sketch the Seismic Refraction method for Ground water exploration. (08 Marks)
b. With a neat sketch, Electric logging for Ground water Exploration. (08 Marks)

Module-5

- 9 a. Explain the different types of wells also give the method of construction for any one of the well. (08 Marks)
b. With the neat sketches, explain the various methods of Ground water recharge. (08 Marks)

OR

- 10 a. Explain what is conjunctive use of water also explain its necessity , technique involved of economics. (08 Marks)
b. Describe what are the pumps used for lifting water from wells, also explain the working principle of centrifugal pump. (08 Marks)

* * * * *

CBCS SCHEME

USN

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|

15CV751

Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020 Urban Transportation and Planning

Time: 3 hrs.

Max. Marks: 80

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

Module-1

- 1 a. Define "System Approach". Explain with flow diagram system approach to transport planning. (08 Marks)
- b. List merits and demerits of mass transit system. (08 Marks)

OR

- 2 a. What is mass transit system? Explain "Para – transit" transport and "Mass and Rapid transit system." (08 Marks)
- b. Write a note on BRTS and metro rails. (08 Marks)

Module-2

- 3 a. What are the various surveys to be carried out in transportation planning process? Explain. (08 Marks)
- b. List and briefly explain the types of inventory of transport facilities. (08 Marks)

OR

- 4 a. Write a note on "Study area" and "Zoning". List the factors affecting on zoning. (08 Marks)
- b. Define External cordon line. Explain the various factors considered in selection of external cordon line. (08 Marks)

Module-3

- 5 a. What is Category analysis? What are the advantages and disadvantages of category analysis? (08 Marks)
- b. The following information was obtained from a transportation survey of a town. Develop a linear regression (of type $y = a + bx$) model for estimating the trips generated from a zone. If the population in a particular zone increases to 40,000 predict the expected trip generation from that zone. (08 Marks)

| | | | | | | | | |
|-------------------------------------|----|----|----|----|----|----|----|----|
| Zone No | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Population in the zone (thousands) | 26 | 28 | 31 | 33 | 22 | 30 | 20 | 25 |
| Total trips generated (in hundreds) | 12 | 11 | 17 | 15 | 12 | 15 | 9 | 13 |

OR

- 6 a. What is Trip distribution? Briefly explain average factor method and mention the disadvantages of the method. (08 Marks)
- b. Obtain the future trip table by uniform growth factor method [Table : Q6(b)]. (05 Marks)

Table Q6(b)

| | | | | | | |
|--|---|---|-----|-----|-----|----------------|
| | O | D | 1 | 2 | 3 | T _i |
| | 1 | | 60 | 100 | 200 | 360 |
| | 2 | | 100 | 20 | 300 | 1260 |
| | 3 | | 200 | 300 | 20 | 3120 |

1 of 2

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

- c. Trip originating from zone 1,2, 3 of study area are 78, 92 and 82 respectively. If the growth factor is 1.3 and cost matrix is shown in table Q6(c). Find the expanded origin constrained growth trip table.

Table Q6(c)

| | | | | |
|-------|----|----|----|-------|
| | 1 | 2 | 3 | O_i |
| 1 | 20 | 30 | 28 | 78 |
| 2 | 36 | 32 | 34 | 92 |
| 3 | 22 | 34 | 26 | 82 |
| O_j | 88 | 96 | 78 | 252 |

(03 Marks)

Module-4

- 7 a. What are opportunity model? Explain types of opportunity model. (06 Marks)
 b. Define Modal split. Explain in brief the factors affecting modal split. (10 Marks)

OR

- 8 A self contained town consists of 4 residential areas A, B, C, D and 2 industrial states X and Y. Generation equations show that for the design year in question, the trips from home to work generated by each residential area per 24 hour day are as follows :

| | | | |
|------|------|------|------|
| A | B | C | D |
| 1000 | 2250 | 1750 | 3200 |

There are 3,700 jobs in industrial estate X and 4,500 in industrial estate Y. It is known that the attraction between zones is inversely proportional to the square of the journey time between zones. The journey times in minutes from home to work are :

| | | | | |
|-------|----|----|----|----|
| Zones | A | B | C | D |
| X | 15 | 15 | 10 | 15 |
| Y | 20 | 10 | 10 | 20 |

Calculate and tabulate the inter zonal trips for journeys from home to work. (16 Marks)

Module-5

- 9 a. What are the applications of traffic assignment? (08 Marks)
 b. Write a note on :
 i) All or nothing assignment ii) Capacity Restraint assignment. (08 Marks)

OR

- 10 a. Explain land use planning models. (10 Marks)
 b. Write a note on user equilibrium assignment. (06 Marks)

* * * * *

CBCS SCHEME

USN

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|

15CV72

Seventh Semester B.E. Degree Examination, Aug./Sept.2020 Design of RCC and Steel Structures

Time: 3 hrs.

Max. Marks: 80

- Note: 1. Answer any TWO full questions, choosing ONE full question from each module.
2. Use of IS-456, IS-800, SP(16), SP(6) and steel tables are permitted.*

Module-1

- 1 Design a slab type rectangular combined footing for two columns, A = 350 mm × 350 mm and B = 400 mm and 400 mm in size to carry axial service load of 600 kN and 900 kN respectively. The columns are spaced at 3.6 m centre to centre. SBC of soil is 175 kN/m². The property line is 0.74m from centre of column A. Use M20 grade concrete and Fe-415 grade steel. (40 Marks)

OR

- 2 Design a single bay portal frame, fixed at the base for the following data:
Effective span of portal frame = 10 m
Spacing of portal frame = 4 m
Height of column above footing = 5.5 m (effective)
Thickness of slab to be adopted = 150 mm
Live load on slab = 1.6 kN/m²
Floor finish = 0.75 kN/m²
SBC of soil = 200 kN/m²
Use M20 grade concrete and Fe 415 steel. Design the slab, beam, column and footing. (40 Marks)

Module-2

- 3 The centre line of a roof truss is as shown in Fig.Q3. The magnitude and nature of forces under service conditions are :
Top Chord members = 120 kN Compression
Bottom Chord members = 100 kN Tension
Interior members = 60 kN Tension and 50 kN Compression
For all the interior members use similar single angle sections. Design all the members and joints using M₁₆ turned bolts of grade 4.6. Also design bearing plate, base plate and anchor bolts to connect the truss to an RCC column 300 mm × 300 mm of M₂₀ grade concrete.

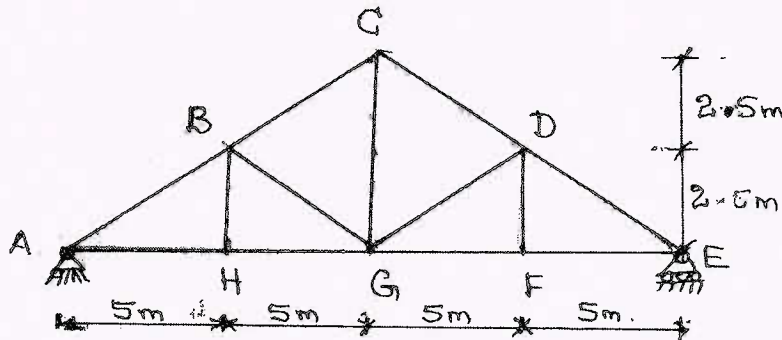


Fig.Q3

(40 Marks)

OR

- 4 Design a welded plate girder, effective span of 18 meters is simply supported at its ends. It carries a uniformly distributed load of 60 kN/m in addition to two point loads each of magnitude 400 kN placed at one third span points. Design:
- (i) Cross section of plate girder at midspan.
 - (ii) End and intermediate stiffeners
 - (iii) Welded connection between flange and web
 - (iv) Welded connection between web and stiffeners

(40 Marks)

* * * * *

CBCS SCHEME

USN

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|

15CV73

Seventh Semester B.E. Degree Examination, Aug./Sept.2020 Hydrology and Irrigation Engineering

Time: 3 hrs.

Max. Marks: 80

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

Module-1

- 1 a. Explain various practical application of hydrology. (08 Marks)
b. With neat sketch, explain an engineering representations of a hydrological cycle (Horton's). (08 Marks)

OR

- 2 a. Explain various methods of obtaining mean precipitations with equations. (08 Marks)
b. The normal annual rainfall of stations A, B, C and D in a catchment are 809.7, 675.9, 762.8, 920.1 mm respectively. In the year 2016, the station D was inoperative when station A, B, C recorded annual rainfall of 911.1, 722.3, 798.9 mm respectively. Estimate the missing rainfall at D in the year 2016 by normal ratio method. (08 Marks)

Module-2

- 3 a. Discuss the various factors affecting evaporation. (08 Marks)
b. The following meteorological data pertain to a large reservoir with water spread area of 15 km². The data represents the average values for the day.
Water temperature = 24°C
Air temperature = 26°C
Atmospheric pressure = 752 mm of mercury
Wind speed at 0.5 m above G.L = 25.3 km/h
Relative humidity = 46%
Estimate average daily evaporation from the reservoir and evaporation loss from the reservoir for a period of one week using Meyer's and Rohwer's equations. (08 Marks)

OR

- 4 a. During November at a particular place, the percentage of sunshine hours is 7.2 and mean temperature is 18°C. If the consumptive use coefficient of crop is 0.7 for that month, find the consumptive use or evapotranspiration of the crop in mm/day by Blaney-Criddle method. (08 Marks)
b. A 6h storm produced rainfall intensity of 7, 18, 25, 12, 10 and 3 mm/h in successive one hour interval over a basin of 800 sq.km. the resulting runoff is observed to be 2640 hectare-metres. Determine the ϕ index for the basin. (08 Marks)

Module-3

- 5 a. What is runoff? Explain with sketch different types of catchment. (08 Marks)
b. Explain the rainfall-runoff relationship using regression analysis (any one method). (08 Marks)

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

OR

- 6 a. Explain with a sketch S-curve and its components. (06 Marks)
 b. Define unit hydrograph. What are the assumptions, limitations and uses of unit hydrograph theory? (10 Marks)

Module-4

- 7 a. Discuss briefly the benefits and ill effects of irrigation. (08 Marks)
 b. Explain with a sketch Bandhara irrigation. (08 Marks)

OR

- 8 a. Explain with equations of various types of irrigation efficiencies. (08 Marks)
 b. The gross commanded area for an irrigation canal is 20,000 hectares out of which 75% is culturable CA. Intensity of irrigation is 40% for rabi and 10% for rice. If Kor period is 4 weeks for rabi and 2.5 weeks for rice, determine outlet discharge. Outlet factors for rabi and rice may be taken as 1800 ha/cumec and 775 ha/cumec respectively. Also calculate delta for each case. (08 Marks)

Module-5

- 9 a. Define the following:
 (i) GCA (ii) CCA (iii) Intensity of irrigation
 (iv) Time factor (iv) Capacity factor (v) Crop rotation (06 Marks)
 b. Design an irrigation channel in alluvial soil according to Lacey's silt theory for the following data:
 Full supply discharge = 10 cumecs
 Lacey's silt factor = 0.9
 Side slope of channel = $\frac{1}{2}$ (H) : 1 (V)
 Also determine the bed slope of the channel. (10 Marks)

OR

- 10 a. Explain:
 (i) Safe yield
 (ii) Average yield
 (iii) Mass curve with sketch
 (iv) Demand curve with sketch (06 Marks)
 b. Explain:
 (i) Investigation for reservoir site
 (ii) Economic height of dam (10 Marks)

* * * * *

CBCS SCHEME

USN

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|

15CV81

Eighth Semester B.E. Degree Examination, Aug./Sept.2020 Quantity Surveying and Contracts Management

Time: 3 hrs.

Max. Marks: 80

*Note: i) For Regular Students: Answer any FIVE full questions irrespective of modules.
ii) For Arrear Students : Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

- 1 Prepare a detailed estimate for a residential building shown in Fig.Q1, for the following items of work:
- (i) Earthwork excavation for foundation in hard soil
 - (ii) BBM walls with CM 1:6 for super structures
 - (iii) Cement plaster (1:3), inside and outside walls.

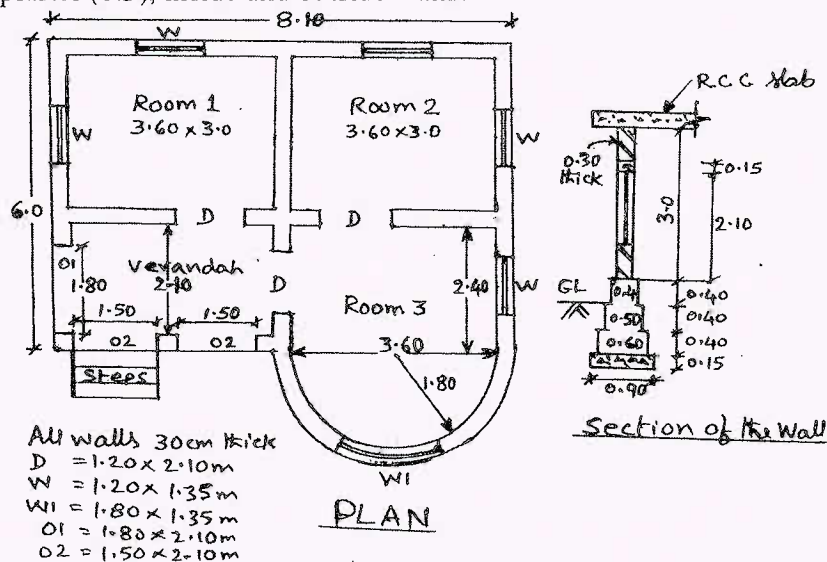


Fig.Q1

(16 Marks)

- 2 Estimate the cost of RCC roof slab in C.C 1:1½ :3 over a room of internal dimension 3.2m x 4.2m. Calculate the quantity of concrete and steel reinforcement. Given : Slab thickness = 150mm, Two-way slab. Steel requirement : Main steel = 10mmφ @ 150 mm c/c Secondary steel : 8mmφ @200mm c/c. Alternate bars cranked at one end only. TMT bars used, hence provide L-bind at ends. Wall thickness = 200 mm, Cost of concrete = Rs. 12,000/m³. Cost of steel bars = Rs. 50/kg.
- (16 Marks)

Module-2

- 3 The details of manhole is given in Fig.Q3. Find its quantities of the following items:
- (i) Earth work excavation for foundation in hard soil.
 - (ii) B.B.M in CM 1:4 for walls
 - (iii) RCC roof vocering slab in C.C. 1:2:4
 - (iv) Plastering in CM 1:3 for inside walls.
 - (v) Bed concrete in CC 1:3:6
- (16 Marks)

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

Module-5

- 9 a. What is measurement book? What are the rules to be followed in recording measurement book? (08 Marks)
- b. A building is situated by the side of a main road. The built up portion is $20\text{m} \times 15\text{m}$. The building is of first class type and provided with water supply, sanitation and electric fitting. Age of the building is 30 years. Workout the valuation of the property. Area of land on which building stands is 500m^2 . Assume plinth area rate as Rs 20,000/ m^2 , life of the building 100 years and cost of land, Rs. 2500/ m^2 . (08 Marks)
- 10 a. Define (i) Obsolescence (ii) Sinking fund (iii) Depreciation (iv) Mortgage (v) Scrap value (vi) Leasehold property. (06 Marks)
- b. A person has purchased a plot of land costing Rs. 8,00,000/- and has constructed a building there on at a total cost of Rs. 20 lakh including water supply, sanitary and electrical installation etc. Allowing a net return @ 7% on the cost of construction and @ 5% net return on the cost of land, workout the standard rent of the property with the following data:
- (i) Sinking fund on 4% basis for the future life of 75 years = 0.0022
- (ii) Annual maintenance 0.5% of the cost of construction
- (iii) Municipal taxes and other outgoings @ 28% of the gross rent. (10 Marks)

* * * * *

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|

Eighth Semester B.E. Degree Examination, Aug./Sept.2020 Design of Prestressed Concrete Structural Elements

Time: 3 hrs.

Max. Marks: 80

- Note:** i) *For Regular Students: Answer any FIVE full questions irrespective of modules.*
 ii) *For Arrear Students : Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

- 1
 - a. Distinguish between pretensioning and post tensioning. (05 Marks)
 - b. Explain why high strength steel and high strength concrete are used in prestressed concrete. (06 Marks)
 - c. Explain with a neat sketch "Hoyer's long line" system of pre-tensioning. (05 Marks)

- 2

A pretensioned concrete beam having an unsymmetrical I-section having overall depth 1300mm, top flange 600mm wide and 250mm thick, bottom flange 350mm wide and 300mm thick and thickness of web is 150mm is used to support live load of 11kN/m over a span of 30m. The prestressing force of 3200kN is located at an eccentricity of 580mm at the centre of span section. Determine the extreme fibre stresses at mid span section when the beam supports dead and live loads assuming the loss of prestress is 15 percent. (16 Marks)

Module-2

- 3
 - a. How do you estimate the loss of prestress due to
 - i) Elastic deformation
 - ii) Shrinkage of concrete
 - iii) Creep of concrete. (06 Marks)
 - b. A pretensioned beam 250mm wide and 360mm deep is prestressed by 10 wires of 8mm diameter initially stressed to 1000N/mm². The centroid of the steel wires is located at 105mm from the soffit. Determine the maximum stress in concrete immediately after transfer allowing elastic shortening of concrete only at the level of the centroid of steel. If however the concrete is subjected to additional shortening due to creep and shrinkage and the steel is subjected to a relaxation of stress of 5 percent. Find the final percentage of loss of prestress in the steel wires.
 Take $E_s = 210\text{kN/mm}^2$, $E_c = 36.85\text{kN/mm}^2$, Creep coefficient = 1.60. Total residual shrinkage strain = 3×10^{-4} . (10 Marks)

- 4
 - a. What are the factors affecting deflection of a PSC beam? (06 Marks)
 - b. A prestressed concrete beam of rectangular section 120mm wide and 300mm deep, span over 6m. The beam is prestressed by a straight cable carrying an effective force of 200kN at an eccentricity of 50mm. The modulus of elasticity of concrete is 38kN/mm². Compute the deflection at centre of span for the following cases:
 - i) Deflection under prestress + self weight
 - ii) Find the magnitude of uniformly distributed live load which will nullify the deflection due to prestress and self weight. (10 Marks)

Module-3

- 5 a. What are the different flexural failure modes observed in prestressed concrete beam? Explain with sketches. (06 Marks)
- b. A post tensioned bridge girder with unbounded tendons is of box section of overall dimensions 1200mm wide \times 1800mm deep with wall thickness 150mm. The high tensile steel has an area of 4000mm² and is located at an effective depth of 1600mm. The effective prestress in steel after all losses is 1000N/mm² and the effective span of the girder is 24m. If $f_{ck} = 40\text{N/mm}^2$ and $f_p = 1600\text{N/mm}^2$, estimate the ultimate flexural strength of the section. (10 Marks)
- 6 Design a post tensioned prestressed concrete roof girder to suit the following data:
 Effective span = 20m
 Live load = 12kN/m
 $f_{ck} = 50\text{N/mm}^2$
 $f_{ct} = 41\text{N/mm}^2$
 lose ratio = 0.85
 Cable containing 12 wires of 7mm diameter ($f_p = 1500\text{N/mm}^2$) are available for use. Design the girder as Type-1 member to confirm IS1343. (16 Marks)

Module-4

- 7 a. Explain different methods of improving shear resistance of PSC members. (06 Marks)
- b. A prestressed girder of rectangular section 150mm wide shear force of 130kN. The uniform prestress across the section is 5N/mm². Given the characteristic strength (cube) strength of concrete is 40N/mm² and Fe-415 HYSD bars of 8mm diameter, design suitable spacing for the stirrups confirming to Indian standard code IS-1343 recommendations. Assume cover to the reinforcement as 50mm. (10 Marks)
- 8 a. Explain mechanism of shear failure in PSC beams. (06 Marks)
- b. The horizontal prestress at the centroid of a concrete beam of rectangular section 120mm \times 250mm is 7N/mm² and the maximum shearing force on the beam is 70kN. Calculate the maximum principal tensile stress, what is the maximum vertical stress required to eliminate this principal stress? (10 Marks)

Module-5

- 9 a. Write a note on zone stresses. (06 Marks)
- b. The end block of a prestressed concrete girder is 200mm wide \times 300mm deep. The beam is post tensioned by two Freyssinet anchorage each of 100mm diameter with their centres located at 75mm from top and bottom of beam. The force transmitted by each anchorage being 2000kN. Compute the bursting force and design suitable reinforcements according to IS1343, sketch the arrangement of anchorage zone reinforcement. (10 Marks)
- 10 The mid section of a composite T beam comprises a pretensioned beam 300mm wide and 900mm deep and an in-situ cast slab 900mm wide and 150mm deep. The effective prestressing located 200mm from the soffit of the beam is 2180kN. The moment due to the weight of the precast section is 273kN-m at mid span. After this is erected in place, the top slab is cast producing a moment of 136.5kN-m at midspan. After the slab concrete is hardened, the composite section is to carry a maximum live load moment of 750kN-m. Compute the resultant final stresses at
 i) The top of slab
 ii) The top and bottom of precast section. (16 Marks)

* * * * *

CBCS SCHEME

USN

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|

15CV833

Eighth Semester B.E. Degree Examination, Aug./Sept.2020 Pavement Design

Time: 3 hrs.

Max. Marks: 80

Note: i) For Regular Students: Answer any FIVE full questions irrespective of modules.

ii) For Arrear Students : Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Briefly explain the Pavement Components and functions of components. (04 Marks)
b. Write comparison between Flexible and Rigid Pavement. (04 Marks)
c. Explain briefly Design factors to be considered in the design of pavement. (08 Marks)
- 2 a. List and briefly explain the assumptions and limitations of Boussinesq's theory. (08 Marks)
b. Design the thickness of a flexible pavement by Burmister's two layer analysis for a wheel load of 40 kN and a tyre pressure of 0.5 MN/m². The modulus of elasticity of the pavement materials is 150 MN/m² and that of the subgrade is 30 MN/m². (08 Marks)

Module-2

- 3 a. With a sketch describe the significance of design wheel load and contact pressure in design of pavement. (04 Marks)
b. Explain the concept of Equivalent Single Wheel Load (ESWL). (04 Marks)
c. Calculate the design repetition for 20 years period for wheel load equivalent to 2268 kg wheel load using the following traffic survey data on a four lane road.

| Wheel load (kg) | Average daily traffic ADT in both directions | % of total traffic volume |
|-----------------|---|---------------------------|
| 2268 | Total volume 215 Considering traffic growth | 13.17 |
| 2722 | | 15.30 |
| 3175 | | 11.76 |
| 3629 | | 14.11 |
| 4082 | | 6.21 |
| 4532 | | 5.84 |

(08 Marks)

- 4 a. Design a highway pavement using McLeod method of wheel load 6000 kg with tyre pressure of 6 kg/cm². The plate load test conducted on subgrade soil using 30 cm dia plate yield a pressure 2.8 kg/cm² after 10 load repetitions at 0.5 cm deflection. (08 Marks)
b. In a dual wheel assembly the load on each wheel is 32 kN tyre pressure is 0.6 N/mm² and c/c wheel spacing 410 mm. The load is placed on a pavement 500 mm thick. The subgrade characterized by $E = 20 \text{ N/mm}^2$ and $\mu = 0.5$. Calculate the deflection on the top of subgrade at the radial distance of 0.15 and 250 from the centre of left wheel measured towards other wheel using deflection chart. (08 Marks)

Module-3

- 5 a. Explain typical failures of flexible pavement. (08 Marks)
b. Briefly explain the various maintenance works of bituminous surfaces. (08 Marks)

- 6 Write notes on:
- a. Roughness measurement (04 Marks)
 - b. Falling Weight Deflectometer (04 Marks)
 - c. Benkelman beam deflection method (08 Marks)

Module-4

- 7 a. Explain:
- (i) Radius of relative stiffness
 - (ii) Equivalent radius of resisting section
 - (iii) Critical load position (08 Marks)
- b. A cement concrete pavement of 25 cm thickness is constructed over a granular surface having modulus of reaction 10 kg/cm^3 . The maximum temperature different between the top and bottom of the slab during winter is found to be 15°C . The spacing between the transverse joint is 7.5 m. Find the worst combination of stresses at the edge and corner regions. (08 Marks)
- 8 a. Write the step by step procedure for the design of concrete pavement as recommended by IRC 52.2002. (08 Marks)
- b. Design the size and spacing of dowel bar at the expansion joints of a cement concrete pavement of thickness 25 cm with radius of relative stiffness 80 cm. For a design wheel load of 5000 kg. Assume load capacity of the dowel system as 40% of the design wheel load joint width is 2 cm, permissible shear and flexural stress in the dowel bar are 1000 and 1400 kg/cm^2 and permissible bearing stresses in cement concrete is 100 kg/cm^2 diameter of dowel bar = 2.5 cm. (08 Marks)

Module-5

- 9 a. Explain the failures in Rigid Pavement. (08 Marks)
- b. Explain different methods of pavement evaluation. (08 Marks)
- 10 a. List the types of joints and explain briefly. (08 Marks)
- b. List and explain the desirable properties of subgrade. (08 Marks)

* * * * *