

# CBCS SCHEME

USN

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

17CV71

## Seventh Semester B.E. Degree Examination, Jan./Feb. 2021 Municipal and Industrial Wastewater Engineering

Time: 3 hrs.

Max. Marks: 100

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

### Module-1

- 1 a. Classify the different sewerage systems and discuss the advantages and disadvantage of each system. (09 Marks)
- b. List the factors considered in determining the quantity of Dry Weather Flow. (04 Marks)
- c. Calculate the ratio of DWF and WWF of a city having the following particulars :  
Area = 50000 hectares , Water supply rate = 200 Lpcd , Population =  $20 \times 10^5$  ,  
Intensity of rainfall = 15mm/hour , Average impermeability factor = 0.5.  
80% of the water supplied reaches sewer. Comment on the result. (07 Marks)

**OR**

- 2 a. Explain with neat sketch laying of sewer line. (05 Marks)
- b. Mention the different types of Manholes and explain one of the Manholes, with neat sketch. (07 Marks)
- c. The drainage area of a town is 18 hectares. The surface of this area is

| Percent of total surface area | Types of surface | Coefficient of runoff |
|-------------------------------|------------------|-----------------------|
| 20 %                          | Hard pavement    | 0.85                  |
| 20 %                          | Roof surface     | 0.80                  |
| 15 %                          | Unpaved sheet    | 0.20                  |
| 30 %                          | Garden and Lawn  | 0.20                  |
| 15 %                          | Wooded area      | 0.15                  |

If the time and concentration for the area 40 minutes, find the maximum runoff. (08 Marks)

### Module-2

- 3 a. Calculate the velocity of flow and discharge in a sewer of circular section having a diameter of 1 in 500, when  $N = 0.012$  and the sewer is running half full. (08 Marks)
- b. With a neat sketch, explain Oxygen Sag Curve. (06 Marks)
- c. Explain the preventive measures required to be adopted for sewage sickness of land. (06 Marks)

**OR**

- 4 a. A waste water effluent of 560 L/s with a BOD = 65 mg/L , DO = 4.0 mg/L and temperature  $23^{\circ}\text{C}$  enters a river where the flow is  $28\text{m}^3/\text{sec}$  and the BOD = 4.0 mg/L, DO = 8.2mg/L and the temperature  $17^{\circ}\text{C}$ .  $K_1$  of the waste is 0.10 per day at  $20^{\circ}\text{C}$ . The velocity of water in the river downstream is 0.18m/s depth of 1.2m. Determine the following after mixing of waste water with river water : i) Combined discharge ii) BOD iii) DO iv) Temperature. (08 Marks)
- b. Explain the various techniques adopted in applying sewage effluents to farms. (06 Marks)
- c. Enumerate on dilution method Vs land disposal method for disposal of sewage. (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.

**Module-3**

- 5 a. The BOD of a sewage sample incubated 1 day at 30°C has been found to be 110mg/L. What will be 5 day at 20°C BOD, if  $K_{(20)} = 0.1/\text{day}$ ? (06 Marks)
- b. Draw the flow diagram of location of unit operations in a waste water treatment plant. (06 Marks)
- c. Design a rectangular grit chamber for a population of 2 lakhs, assuming per capita sewage = 120 L/day, quantity of grit at the rate of 25 L/min and velocity = 0.3m/sec and  $d = 0.2\text{mm}$ . (08 Marks)

**OR**

- 6 a. Design a circular sedimentation tank for the primary treatment of a sewage at 13.5 million litres per day. Check the surface loading. (06 Marks)
- b. List the advantages and disadvantages of activated sludge process. (08 Marks)
- c. Explain sludge digestion process with flow chart. (06 Marks)

**Module-4**

- 7 a. Explain the different techniques required to adopt strength reduction in industrial plant (any five). (10 Marks)
- b. List the various methods of removal of organic dissolved solids (any five). (10 Marks)

**OR**

- 8 a. Mention the advantages of the combined treatment. (08 Marks)
- b. Discuss the acceptable methods for neutralizing excess acidity or alkalinity in waste water. (08 Marks)
- c. Differentiate between effluent standards to stream standards. (04 Marks)

**Module-5**

- 9 a. Explain with a flow chart, the processes of cotton textile industry in manufacturing and the treatment methods adopted for waste water generated. (10 Marks)
- b. With a neat flow diagram, bring out the manufacturing process and sources of waste water generation from sugar cane industry. (10 Marks)

**OR**

- 10 a. Draw the flow sheet for waste water treatment in a large distillery complex by discussing the characteristics of waste. (10 Marks)
- b. For a paper and pulp industry discuss the various steps in generation of waste water during the manufacturing and treatment of the waste water before discharging on receiving water courses or sewers. (10 Marks)

\* \* \* \* \*



# CBCS SCHEME

USN

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

17CV72

## Seventh Semester B.E. Degree Examination, Jan./Feb. 2021 Design of RCC and Steel Structures

Time: 3 hrs.

Max. Marks: 100

- Note:** 1. Answer any ONE full question from Module-1 and Module-2.  
2. Use of IS-456, IS-800, SP-6(1), SP-16 and Steel tables may be permitted.

### Module-1

- 1 Design a cantilever retaining wall to retain earth embankment 4.0 m high above the average ground level. The density of soil is  $18 \text{ kN/m}^3$  and its angle of repose is  $30^\circ$ . The safe bearing capacity of the foundation soil may be taken as  $200 \text{ kN/m}^2$ . Coefficient of friction between soil and concrete may be taken as 0.5. Use M20 grade concrete and Fe-415 steel. Design all the components of the retaining wall with necessary checks and write a neat sketch of the cross section of the components showing reinforcement details. (50 Marks)

OR

- 2 Design a combined rectangular footing slab type for two columns A and B, carrying loads of 500 kN and 700 kN respectively. The cross section dimension of column 'A' is 300 mm × 300 mm and column 'B' is 400 mm × 400 mm. The width of the footing is restricted to 1.80 m. the centre to centre spacing of columns is 3.40 m. The safe bearing capacity of the foundation soil is  $150 \text{ kN/m}^2$ . Use M20 grade concrete and Fe-415 steel. The design must include all the necessary safety checks and write a neat sketch of the cross section of the components showing the reinforcement details. (50 Marks)

### Module-2

- 3 Design a simply supported welded plate girder for an effective span of 24.0 m. The plate girder is laterally supported for its entire length and it is subjected to an imposed service load of 75 kN/m which is inclusive of its self weight. The steel plates available is of Fe-410 grade. The design includes proportioning the dimensions of web and flange plate, section classification, check for bending and shear capacity of the section, design of welded connections and necessary stiffness along with check for deflection. Write a neat sketch of design details describing all the parts. (50 Marks)

OR

- 4 Design a steel roof truss with its geometry as shown in Fig.Q4. The analysed forces in the members due to dead load, live load and wind load are given in Table.Q4 for principal rafter, principal tie and for major sling member. Determine the maximum design forces due to load combinations as per IS-800 for the above mentioned members and design the same members with all the necessary checks including for reversal of stresses. Use 16 mm diameter bolt of grade 4.6 for the member end connections. Write a neat sketch of the design details describing all the parts. Steel section available is Fe-410 grade.

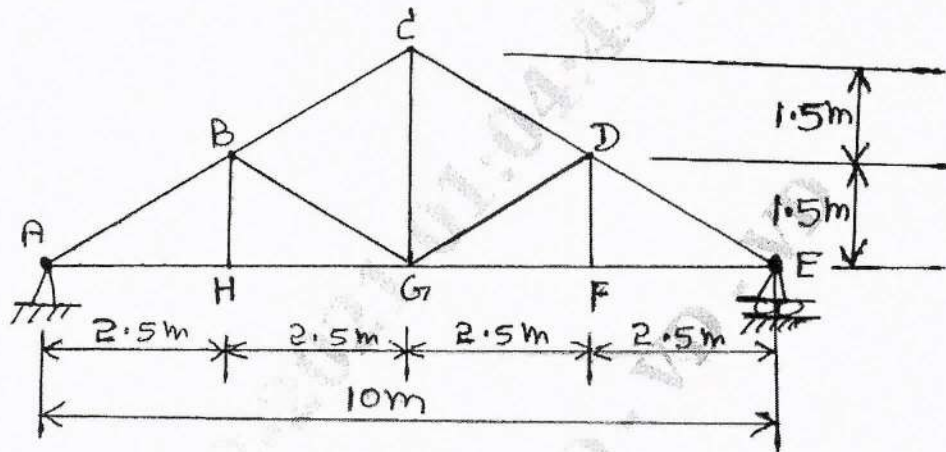


Fig.Q4

| Member      | Length (m) | Dead Load (kN) | Live Load (kN) | Wind Load (kN) |
|-------------|------------|----------------|----------------|----------------|
| Rafter (AB) | 2.92       | -58.0          | -52.5          | +111.6         |
| Tie (AH)    | 2.50       | +52.0          | +47.0          | -102.4         |
| Sling (BG)  | 2.92       | +20.3          | +18.4          | -63.0          |

Note: + → Tensile force

- → compressive force

Table.Q4

(50 Marks)

\*\*\*\*\*



# CBCS SCHEME

USN

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

17CV73

## Seventh Semester B.E. Degree Examination, Jan./Feb.2021 Hydrology and Irrigation Engineering

Time: 3 hrs.

Max. Marks: 100

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

### Module-1

- 1 a. List and explain the importance of hydrology. (10 Marks)  
 b. What is hydrological cycle? Explain with neat sketch, Horton's engineering representation of hydrological cycle. (10 Marks)

**OR**

- 2 a. What is Rain gauge? Explain with neat sketch non recording types of raingauge. (10 Marks)  
 b. The average annual rainfall of 6 rain gauge stations in a basin are 89, 68, 54, 45, 41 and 55 cm. If the error in the estimation of basin rainfall should not exceed 10%. How many additional rain gauges should be installed in the basin? (10 Marks)

### Module-2

- 3 a. What is evaporation? Explain the factors affecting evaporation. (10 Marks)  
 b. A reservoir had a average surface area of 20 km<sup>2</sup> during June. In that month the mean rate of inflow = 10 m<sup>3</sup>/sec. Mean outflow = 15 m<sup>3</sup>/sec, monthly rainfall = 10 cm and change in storage = 16 million m<sup>3</sup>. Assuming the seepage losses to be 1.8 cm. Estimate the evaporation in that month. (10 Marks)

**OR**

- 4 a. Explain the process of methods to control evaporation from lakes. (10 Marks)  
 b. What are the factors affecting the infiltration? Explain with neat sketch double ring infiltrometer. (10 Marks)

### Module-3

- 5 a. What is runoff? List and explain the factors affecting on it. (10 Marks)  
 b. The following ordinates are of 3 hr unit hydrograph. Find out the volume of surface runoff from 1.5 cm effective rainfall of 3 hr duration.

|                           |   |     |      |    |      |    |      |     |     |    |    |
|---------------------------|---|-----|------|----|------|----|------|-----|-----|----|----|
| Time in (Hr)              | 0 | 6   | 12   | 18 | 24   | 30 | 36   | 42  | 48  | 54 | 60 |
| Unit Hydrograph ordinates | 0 | 5.1 | 21.6 | 27 | 23.5 | 17 | 10.7 | 6.2 | 3.2 | 1  | 0  |

(10 Marks)

**OR**

- 6 a. Define Hydrograph. With neat sketch explain component parts of hydrograph. (10 Marks)  
 b. Find out the ordinates of a storm hydrograph resulting from a 3 hr storm with rain fall of 3, 4.5 and 1.5 cm during subsequent 3 hr intervals. The ordinates of unit hydrograph are given in the table.

|              |   |    |     |     |     |     |     |     |     |    |    |    |    |
|--------------|---|----|-----|-----|-----|-----|-----|-----|-----|----|----|----|----|
| Hr           | 0 | 03 | 06  | 09  | 12  | 15  | 18  | 21  | 24  | 03 | 06 | 09 | 12 |
| OVH (cumecs) | 0 | 90 | 200 | 350 | 450 | 350 | 260 | 190 | 130 | 80 | 45 | 20 | 0  |

Assume an initial loss of 5 mm infiltration index of 5 mm/hr and base flow of 20 cumecs.

(10 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-4**

- 7 a. What is the necessity of irrigation in India and write benefits and ill effects of irrigation? (10 Marks)  
 b. Explain in detail system of irrigation. (10 Marks)

**OR**

- 8 a. What is irrigation frequency? Explain the factors affecting on frequency of irrigation. (10 Marks)  
 b. The gross commanded area for a distributor is 20000 hectares, 75% of which can be irrigated. The intensity of irrigation for Rabi season is 40% that for Kharif season 10%. If Kov period is 4 weeks for Rabi and 2.5 weeks for Kharif. Determine the out let discharge. Outlet factors for Rabhi and Kharif may be assumed as 1800 hectares/cumecs and 775 hectares/cumec. Also calculate delta for each crop. (10 Marks)

**Module-5**

- 9 a. Write the difference between Lacey's theory and Kennedy's theory. (10 Marks)  
 b. The slope of a channel in alluvial soil is  $s = \frac{1}{5000}$ . Lacey's silt factor  $f = 0.9$ . Channel side slope are  $\frac{1}{2}H:1V$ . Find the channel section and maximum discharge which can be allowed to flow in it. (10 Marks)

**OR**

- 10 a. With a neat sketch, explain zones of storage in a reservoir. (10 Marks)  
 b. Explain Hydrologic investigation of reservoir planning? List the points to be consider for selection of site for a reservoir. (10 Marks)

\*\*\*\*\*



# CBCS SCHEME

USN

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

17CV742

## Seventh Semester B.E. Degree Examination, Jan./Feb. 2021 Ground Water and Hydraulics

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 importance of ground water. (06 Marks)  
b. Describe the vertical distribution of ground water with neat sketches. (10 Marks)  
c. Explain the Perched Aquifer with neat sketches. (04 Marks)

OR

- 2 a. Describe confined aquifer and unconfined aquifer with neat sketches. (12 Marks)  
b. Write a note on the following with examples:  
(i) Aquifers (ii) Aquiclude (iii) Aquifuge (iv) Aquitard (08 Marks)

### Module-2

- 3 a. What is storage coefficient? Explain its characteristics in confined and un-confined aquifers with neat sketches. (10 Marks)  
b. An artesian aquifer 20 m thick has a porosity of 20% and bulk modulus of compression  $10^8 \text{ N/m}^2$  estimate the storage coefficient of the aquifer. What fraction of this aquifer is attributed to the expansibility of water? (10 Marks)

OR

- 4 a. Describe Darcy's law with neat sketches. (08 Marks)  
b. In a phreatic aquifer extending over  $1 \text{ km}^2$  the water table was initially at 25 m below ground levels. Some time after irrigation with a depth of 20 cm of water the water table rose to a depth of 24 m below ground level, later  $3 \times 10^5 \text{ m}^3$  of water was pumped out and water table dropped to 26.2 m below ground level.  
(i) Determine the specific yield of the aquifer  
(ii) Deficit in soil moisture (below ground capacity) before irrigation (08 Marks)  
c. Differentiate between specific yield and specific retention. (04 Marks)

### Module-3

- 5 a. Describe the steady radial flow into a well in confined aquifer. (10 Marks)  
b. A 30 cm well fully penetrates a confined aquifer 30 m deep. After a long period of pumping at rate of 1200 litres per minute the draw down in the wells at 20 and 45m from the pumping well are found to be 2.2 and 1.8 m respectively. Determine the transmissibility of the aquifer. What is the drawdown in the pumped well? (10 Marks)

OR

- 6 a. Describe the unsteady radial flow into a well in unconfined aquifer. (10 Marks)  
b. A confined aquifer with transmissibility of  $1550 \text{ m}^2/\text{day}$  and storage coefficient of  $4.75 \times 10^{-4}$  is pumped at the rate of  $2880 \text{ m}^3/\text{day}$ . Determine the drawdown distribution around the pumping well. Find out the radius of influence after 1 day pumping. When four wells located 10 m away also operate simultaneous, what will be the additional drawdown? (10 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.

**Module-4**

- 7 a. Describe the ground water exploration using electrical resistivity method. (10 Marks)  
b. Explain the following:  
(i) Electrical logging (05 Marks)  
(ii) Radioactive logging (05 Marks)

**OR**

- 8 a. Describe the ground water exploration using Seismic method. (10 Marks)  
b. Describe the following:  
(i) Induction logging (05 Marks)  
(ii) Sonic logging (05 Marks)

**Module-5**

- 9 a. Explain the different types of deep bore wells. (10 Marks)  
b. Explain the parts of the Dug well with neat sketches. (05 Marks)  
c. Write a note on driven wells. (05 Marks)

**OR**

- 10 a. Describe the following:  
(i) Jetted wells (04 Marks)  
(ii) Groundwater run-off (04 Marks)  
b. Describe the different types of artificial ground water recharge methods. (12 Marks)

\* \* \* \* \*



# CBCS SCHEME

USN

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

17CV751

## Seventh Semester B.E. Degree Examination, Jan./Feb.2021 Urban Transportation and Planning

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 system approach to transport planning using a flowchart. (10 Marks)  
 b. What is Urbanization? State the causes of Urbanization. (10 Marks)

OR

- 2 a. What are the transportation problems? Explain briefly. (08 Marks)  
 b. Explain the classification of transit system with examples. (08 Marks)  
 c. Highlight the difference between Metro trains and BRTS. (04 Marks)

### Module-2

- 3 a. Define external Cordon line. What factors should be given due weightage in the selection of external Cordon line. (07 Marks)  
 b. What is zoning? Discuss the points to be kept in mind while doing zoning. (07 Marks)  
 c. Explain study area. List out the inventories of transport facilities, Explain any two. (06 Marks)

OR

- 4 a. Mention the different types of transport surveys that are to be carried out? Explain briefly. (09 Marks)  
 b. List out the use of secondary sources. Explain. (05 Marks)  
 c. What is Sampling? Discuss various types of Samplings. (06 Marks)

### Module-3

- 5 a. List the methods available for trip distribution for future. Explain any two methods. (06 Marks)  
 b. What is multiple linear regression analysis? Mention the assumptions made. (06 Marks)  
 c. The following Fig. Q5 (c) shows trip distribution for the base year.

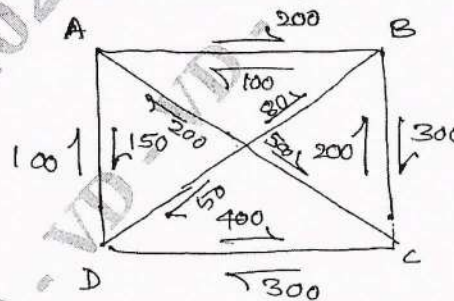


Fig. Q5 (c)

The origin and destination growth factor are as follows:

| GF          | Zone |     |   |     |
|-------------|------|-----|---|-----|
|             | A    | B   | C | D   |
| Origin      | 3    | 2.5 | 2 | 1.6 |
| Distination | 1.2  | 1.5 | 3 | 2.4 |

Distribute the trips for the horizon year using furness 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 in detail the factors governing trip generation and attraction rates. (08 Marks)  
 b. Mention the assumptions made in category analysis. (05 Marks)  
 c. The following data shows average household size and total trips made per day for a particular zone of study area. Develop the trip distribution equation and also compute the coefficient of correlation.

| Average house hold size | Total trips per day |
|-------------------------|---------------------|
| 2                       | 4                   |
| 3                       | 6                   |
| 4                       | 7                   |
| 5                       | 8                   |
| 6                       | 10                  |

(07 Marks)

**Module-4**

- 7 a. What are the factors affecting modal split? Explain briefly. (08 Marks)  
 b. Draw the flow diagram for modal split carried out between trip generation and trip distribution. (06 Marks)  
 c. Differentiate between “trip end” and trip “interchange” of modal split. Specify variables used, explain any two variables. (06 Marks)

OR

- 8 a. Write a short note on opportunity models. (06 Marks)  
 b. Explain in detail the opportunity model relating to synthetic method. (06 Marks)  
 c. The total trips produced in and attracted to the three zones A, B and C of a survey area in the design year are tabulated as,

| Zone | Trip produced | Trip attracted |
|------|---------------|----------------|
| A    | 2000          | 3500           |
| B    | 3500          | 4800           |
| C    | 4800          | 2000           |

It is known that the trip between two zones are inversely proportional to the second power of the travel time between zones, which is 25 minutes. If the trip interchange between zones B and C is 300. Calculate the trip interchange between zones A and B, A and C, B and A, C and B. (08 Marks)

**Module-5**

- 9 a. List the various assignment techniques and explain briefly. (08 Marks)  
 b. Explain the application of the traffic assignment. (06 Marks)  
 c. Briefly explain coding, route properties. (06 Marks)

OR

- 10 a. Discuss the points for the selection of Land use transport model. (10 Marks)  
 b. Write a flow chart of fundamental structure of Lowry model and explain principal components of the model. (10 Marks)

\*\*\*\*\*



# CBCS SCHEME

USN

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

15CV71

## Seventh Semester B.E. Degree Examination, Jan./Feb. 2021 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. Any missing data can be assumed.*

### Module-1

- 1 a. Define Dry Weather Flow. Explain the factors influencing DWF. (05 Marks)  
b. Differentiate between conservancy system and water carriage system. (05 Marks)  
c. Calculate the quantity of sewage for separate and partially separate system for a town given the following data:  
i) Area of the town – 250 hectares  
ii) Intensity of rain fall – 50mm/hr  
iii) Population density – 300 person/hectare  
iv) Rate of supply – 250/pcd  
v) Peak factor – 2.0  
vi) Surface classification

| Type of surface   | % Area | Run off coefficient |
|-------------------|--------|---------------------|
| Roofs             | 50%    | 0.9                 |
| Paved surface     | 20%    | 0.85                |
| Non paved surface | 30%    | 0.30                |

Assume 80% of the water supplied reaches the sewer. (06 Marks)

### OR

- 2 a. Explain the desirable characteristics of a sewer material. (05 Marks)  
b. Write a note on ventilation of sewers. (05 Marks)  
c. Develop a relationship between a diameter of the circular section of a sewer and a side of the rectangular sewer section having width as twice its depth the three sides are wetted. (06 Marks)

### Module-2

- 3 a. Explain self purification phenomenon with a neat sketch of oxygen sag curve. (05 Marks)  
b. Explain self cleaning velocity and non sourcing velocity. (05 Marks)  
c. Design a sewer to a population of 60,000 the rate of water supply is 135/pcd. The slope available for the sewer to be laid is 1 in 625 and the sewer should be designed to carry four times the DWF when running full. What would be the velocity of flow? Take  $N = 0.012$ . (06 Marks)

### OR

- 4 a. Explain: i) Sewage farming ii) Sewage sickness. (08 Marks)  
b. Explain the methods of sewage disposal i) By dilution ii) By land treatment. (08 Marks)

**Module-3**

- 5 a. Derive an expression for first stage BOD with usual notations. (06 Marks)  
 b. Define the terms BOD and COD. (04 Marks)  
 c. The 5 day BOD @ 20°C of a sewage sample was found to be 100mg/l. Calculate 2 day BOD at 30°C for the same sample,  $K_{20} = 0.1/\text{day}$ . (06 Marks)

**OR**

- 6 a. Write a detailed flow diagram of a sewage treatment plant for a large city. Indicate the components. (06 Marks)  
 b. With a neat sketch, explain working principle of activated sludge process. (06 Marks)  
 c. Mention the operational problems of trickling filter process. (04 Marks)

**Module-4**

- 7 a. Discuss in detail the impact of industrial wastewater on water bodies. (08 Marks)  
 b. Briefly explain strength reduction strategy for an industrial effluent concerned with waste treatment. (08 Marks)

**OR**

- 8 a. List the techniques applied in removal of suspended solids. Explain any two methods. (08 Marks)  
 b. Briefly explain the circumstances under which joint treatment of domestic wastewater and industrial wastewater is recommended. (08 Marks)

**Module-5**

- 9 Explain briefly the characteristics and treatment of cane sugar mill effluent with the aid of a flow chart. (16 Marks)

**OR**

- 10 a. Explain the sources and characteristics of tannery wastewater with the help of flow diagram. (10 Marks)  
 b. Explain in brief the effect of dairy waste in receiving streams. Also propose a treatment for dairy wastewater. (06 Marks)

\* \* \* \* \*



# CBCS SCHEME

USN

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

15CV72

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021

## Design of RCC and Steel Structures

Time: 3 hrs.

Max. Marks: 80

- Note:** 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. Use of IS456-2000 and SP16, IS800, -steel tables is permitted.

### Module-1

- 1 Design RCC rectangular combined footings for two columns which are 3.6m apart carrying a load of 1000kN and 1500kN. Sizes of column are 400mm × 400mm and 600 × 600mm. Width of footing is 1.8m SBC of soil is 280 kN/m<sup>2</sup>. M20 concrete and Fe415 steel is used. Assume beam and slab type combined footing sketch the details of Reinforcement. (40 Marks)

OR

- 2 RCC hall 10m wide 20m long is provided with portal frame 4m c/c. Frame are fixed at bottom. Heights of columns are 16.5m. Live load = 1.5 kN/m<sup>2</sup> SBC = 120 kN/m<sup>2</sup>. Design the slabs, portal Frame, column and footing using M20 concrete and Fe 415 steel. Sketch details of reinforcement. (40 Marks)

### Module-2

- 3 Design a plate girder for an effective span 14m. Load on the girder consist of UDL 45 kN/m in addition to two point loads each of magnitude 400kN placed at a distance of 3m, on either side of mid span point of girder, Design Mid span cross section curtailment of flange, Intermediate stiffness and end bearing stiffness. Draw sketch showing detail of longitudinal section cross section at mid span and support and plan of girder. (40 Marks)

OR

- 4 Design a gantry girder for a span 25m column spacing = 8m, Wheel base = 3.5m, Crane capacity = 200kN, Weight of crane bridge = 150 kN, Weight of trolley crab = 75kN, Min hook distance = 1m, Weight of rail = 0.3 kN/m, height of rail = 105mm. Draw suitable sketch showing details of cross section, Longitudinal section and plan. (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.



# CBGS SCHEME

USN

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

15CV73

## Seventh Semester B.E. Degree Examination, Jan./Feb.2021 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. Explain Global and India water availability. (07 Marks)  
b. Explain with neat sketch an engineering representation of hydrologic cycle. (09 Marks)

**OR**

- 2 a. What is precipitation? Explain different forms of precipitation. (09 Marks)  
b. The average rainfall of 5 rain gauges in the base stations are 890, 540, 450, 410 and 550 mm. If the error in the estimation of rain fall should not exceed 10%, how many additional gauges may be required? (07 Marks)

### Module-2

- 3 a. List the factors affecting evaporation. (05 Marks)  
b. Describe the ISI standard evaporation pan with a neat sketch. (07 Marks)  
c. What is the evaporation, if 4.75 litres of water is removed from an evaporation pan of diameter 1.22 m and the simultaneous rainfall measurement is 8.8 mm? (04 Marks)

**OR**

- 4 a. Describe how infiltration capacity rate can be measured using a double ring infiltrometer. (08 Marks)  
b. Define  $\phi$ -index and W-index. (04 Marks)  
c. In the month of November for a particular place, monthly percentage of hours of bright sunshine is 7.2 and mean temperatures 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 Balney-Criddle method. (04 Marks)

### Module-3

- 5 a. What is runoff? Discuss the factors affecting the runoff. (10 Marks)  
b. Explain with sketches different shapes of catchment. (06 Marks)

**OR**

- 6 a. What are the components of hydrographs? Explain how base flow is separated from a hydrograph. (06 Marks)  
b. What is unit hydrograph? What are the assumptions made in derivation of UH theory. (04 Marks)  
c. What are the uses and applications of unit hydrograph? (06 Marks)

### Module-4

- 7 a. What is irrigation? What are the advantages and disadvantages of irrigation? (08 Marks)  
b. Explain Bandhara Irrigation with a sketch. Give briefly the advantages and disadvantages of bandhara Irrigation. (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

- 8 a. Explain the terms duty, delta and base period. Derive a relation ship between the two for a given base period. (08 Marks)
- b. If the depth of water stored at 5 points in a field are 1.0, 0.9, 0.8, 0.7 and 0.6 m. Determine the water distribution efficiency. (04 Marks)
- c. (i) Find the delta of crop if the duty is 1800 ha/cumec and the base period is 130 days.  
 (ii) What would be the duty if the delta is increased by 20% and the base period reduced by 10 days? (04 Marks)

**Module-5**

- 9 a. What is Canal? What are the different types of canals? (06 Marks)
- b. Explain with a sketch Ridge canal or water shed alignment of canals. (06 Marks)
- c. Define the following terms:  
 (i) Gross command area  
 (ii) Cultural command area.  
 (iii) Any two difference between lined and unlined canals. (04 Marks)

OR

- 10 a. The slope of the channel in aluminum is  $\frac{1}{4000}$ , Lacey's silt factor is 0.9 and side slope are  $\frac{1}{2}(H) : 1(V)$ . Find the channel section and maximum discharge which can be allowed to flow in it. (08 Marks)
- b. Briefly explain :  
 (i) Investigation for reservoir site.  
 (ii) Economic height of a dam. (08 Marks)

\*\*\*\*\*

# CBCS SCHEME

USN

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

15CV741

## Seventh Semester B.E. Degree Examination, Jan./Feb. 2021 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 IRC-6, IRC-21, IRC-112, IS458-1988 is permitted.  
3. Missing data may be assumed suitably.*

### Module-1

- 1 a. Briefly explain the following term related to bridge engineering atleast with one relevant formula for each.  
(i) Afflux (ii) Scour (06 Marks)  
b. Derive the condition of Economic Span of bridge. (10 Marks)

### OR

- 2 a. What is impact factor, briefly explain the impact allowances in IRC class A loading. (06 Marks)  
b. Determine the waterway for the bridge across a stream with flood discharge of  $225 \text{ m}^3/\text{s}$ , velocity 1.5 m/s and width of flow at high level in 60m, the allowable velocity under the bridge is 1.8 m/s. (10 Marks)

### Module-2

- 3 Design a reinforced concrete slab culvert for national highway over a stream crosses a road at an angle of  $90^\circ$ . The design datas are as follows:  
Carriage way (two lane) = 7.5 m  
Footpath = 1m on Either side  
Clear span = 6m  
Wearing coat = 80mm  
Width of bearing = 400mm  
Material :  $M_{25}$  grade concrete and Fe-415, HYSD Bars  
Loading : IRC class AA tracked vehicle. (16 Marks)

### OR

- 4 Design the Skew slab culvert to suit the following data:  
Clear span = 6 m, Skew angle =  $10^\circ$ , Width of carriage way = (Two lane) = 7.5 m  
Wearing coat = 80 mm, Width of bearing = 400mm.  
Material :  $M_{25}$  grade concrete, Fe 415 HYSD Bars  
Loading : IRC class AA tracked vehicle. (16 Marks)

### Module-3

- 5 Design the cantilever slab of 'T' beam bridge for the following data:  
Width of road way = 7.5m  
Width of kerb = 0.6m  
Depth of kerb = 0.3m  
No. of longitudinal girder = 3  
Spacing of longitudinal girder = 2.5m  
Thickness of wearing coat = 80mm  
Type of loading : IRC class A wheel load  
Materials :  $M_{20}$  grade concrete, Fe-415 HYSD Bars. (16 Marks)



OR

- 6 Design the longitudinal girder of the 'T' beam bridge for following data by using Courbon's method for reaction factor:  
 Number of longitudinal girder = 3  
 Spacing of longitudinal girder = 3 m  
 Spacing of cross girders = 3.5m  
 Loading from cantilever portion from two sides = 31.32 kN.  
 Loading from deck = 41.32 kN  
 Span of the bridge = 14 m  
 Material : M<sub>40</sub> grade concrete, Fe 415 Steel  
 Loading : IRC class AA tracked vehicle. (16 Marks)

Module-4

- 7 Design a box culvert having inside dimension of 3m × 3m. This culvert is subjected to a dead load of 14000 N/m<sup>2</sup> and live load of IRC-class AA tracked vehicle. Assume the unit weight of the soil to be 18000 N/m<sup>3</sup>, the angle of repose of the soil is 30°C. The culvert is to be designed for particular case when dead load and live load acting from outside while no water pressure inside. The width of road is 7.5m and span is 3.3m. Use M<sub>25</sub> grade concrete and Fe-415 HYSD Bars. (16 Marks)

OR

- 8 Design a pipe culvert through a road embankment of height 6m. The width of road is 7.5m and the formation width is 10m. The side slope of the embankment is 1.5:1. The maximum discharge is 5 m<sup>3</sup>/s. The safe velocity is 3 m/s. Assume bellmouth entry. Consider loading as IRC-class AA tracked vehicle. Given  $C_e = 1.5$ ,  $C_s = 0.010$  and unit weight of soil is 20 kN/m<sup>3</sup>. (16 Marks)

Module-5

- 9 A stone masonry abutment used for highway bridge having bottom width of 2 m and top width of 1m. The height of the abutment is 3m. The vertical load is 15 kN, the live load and dead load being 20 kN acting at 1/3<sup>rd</sup> of the height from the base. SBC of soil is 150 kN/m<sup>2</sup>. Coefficient of friction is 0.5, the density of stone masonry is 25 kN/m<sup>3</sup>. Compute the stress developed at the base and check the stability of the abutment. (16 Marks)

OR

- 10 a. List the types of Expansion bearing. Briefly explain any one with neat sketch. (08 Marks)  
 b. List the types of expansion joints used in bridges and briefly explain any one with neat sketch. (08 Marks)

\*\*\*\*\*

# CBCS SCHEME

USN

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

15CV742

## Seventh Semester B.E. Degree Examination, Jan./Feb. 2021 Ground Water and Hydraulics

Time: 3 hrs.

Max. Marks: 80

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

### Module-1

- Write a note on importance of ground water. (08 Marks)
  - Explain briefly occurrence of ground water in different rocks and soils. (08 Marks)

OR

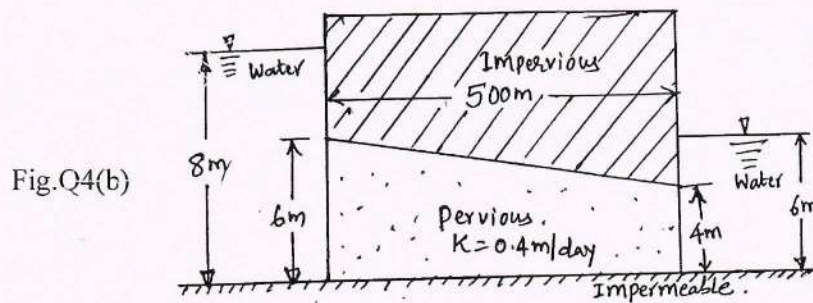
- With the help of neat sketches, explain i) Unconfined ii) Confined and iii) Perched aquifer. (08 Marks)
  - With the help of a neat sketch, explain Vertical distribution of ground water. (08 Marks)

### Module-2

- State and explain Darcy's law. Explain its validity and limitations. (08 Marks)
  - It was observed in a field test that 3 hour 30 minutes 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 Reynold's number for the flow, assuming an average grain size of 1mm and kinematic viscosity of water as 0.008 stokes. (08 Marks)

OR

- Define i) Storage coefficient ii) Transmissibility iii) Permeability and iv) Intrinsic permeability. (08 Marks)
  - What is the flow rate in the confined aquifer shown in fig. Q4(b). Take width = 800m. (08 Marks)



### Module-3

- Explain Cooper – Jacob method to determine storage coefficient and transmissivity of aquifer. (08 Marks)
  - A gravity well has a diameter of 60cm. The depth of water in the well is 40 meters before pumping is started. When pumping is being done at the rate of 2000 litres per minute, the drawdown in a well 10 meters away is 4 meters and in another 20 meters away is 2 meters. Determine i) Radius of zero drawdown ii) Coefficient and Permeability and iii) Drawdown in the well. (08 Marks)



OR

- 6 a. Derive an expression for discharge from a well penetrated in a confined aquifer. (08 Marks)  
 b. A well fully penetrating a confined aquifer is pumped at a uniform rate of 2500 litres per minute. The draw downs in an observation well situated at 60m away are given in table below. Determine formation constants of aquifer. Use Cooper – Jacob method. (08 Marks)

|              |     |      |      |      |      |       |       |       |        |        |      |
|--------------|-----|------|------|------|------|-------|-------|-------|--------|--------|------|
| Time (min)   | 0   | 1.50 | 3.00 | 6.0  | 10.0 | 18.00 | 40.00 | 80.00 | 120.00 | 180.00 | 240  |
| Draw down(m) | 0.0 | 0.26 | 0.36 | 0.48 | 0.56 | 0.66  | 0.80  | 0.91  | 0.98   | 1.05   | 1.10 |

Module-4

- 7 a. With the help of a neat sketch, explain Seismic Refraction method. (08 Marks)  
 b. With the help of a neat sketch, explain radioactive logging. (08 Marks)

OR

- 8 a. Explain Electrical Resistivity method of ground water exploration. (08 Marks)  
 b. Explain briefly i) Sonic Logging and ii) Induction Logging. (08 Marks)

Module-5

- 9 a. With the help of a neat sketch, explain Strainer type tube well. (08 Marks)  
 b. What are the objectives and benefits of artificial ground water recharge? (08 Marks)

OR

- 10 a. With the help of a neat sketch, explain working of a submersible pump. (08 Marks)  
 b. Explain ground water recharge using : i) Check dams and ii) Farm ponds. (08 Marks)

\* \* \* \* \*

# CBCS SCHEME

USN

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

15CV751

## Seventh Semester B.E. Degree Examination, Jan./Feb. 2021 Urban Transportation and Planning

Time: 3 hrs.

Max. Marks: 80

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

### Module-1

- 1 a. Explain Briefly, the need and role of metro rail transportation with its relative advantages. (08 Marks)  
b. List the various urban traffic and transport problems in India. (08 Marks)

OR

- 2 a. Compare the mass, public and private transport systems, in detail. (08 Marks)  
b. Explain briefly, the various stages involved in urban transport planning process. (08 Marks)

### Module-2

- 3 a. Define zone. Mention the different factors considered in dividing the whole area into zones. (08 Marks)  
b. List various surveys required to collect data in urban transport planning and explain home interview survey, in detail. (08 Marks)

OR

- 4 a. Briefly explain, the expansion of data from samples and expansion factors used in urban transport planning. (06 Marks)  
b. Explain with sketch, various basic movements in transportation survey. (05 Marks)  
c. Explain four important factors considered while selecting external cordon line. (05 Marks)

### Module-3

- 5 a. Explain the various factors governing trip generation and trip attraction. (06 Marks)  
b. List the various assumptions considered in category analysis. (05 Marks)  
c. Explain multiple linear regression analysis. (05 Marks)

OR

- 6 a. Briefly explain Furness method, with its advantages and disadvantages. (06 Marks)  
b. The table below gives data for vehicle trips/day, income and persons in a household for one of the study area. Develop the trip generation equations between income and household persons. Indicate which one is more reliable and why?

|                     |   |    |    |    |    |    |
|---------------------|---|----|----|----|----|----|
| Income (lakhs/year) | 5 | 10 | 15 | 20 | 25 | 30 |
| Persons/ household  | 4 | 6  | 8  | 9  | 8  | 6  |
| Trips/day           | 5 | 6  | 8  | 4  | 4  | 6  |

(10 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-4**

- 7 a. Explain the various factors governing modal split. (06 Marks)
- b. A self contained town consists of four residential areas A, B, C and D and two intermediate estates X and Y. Generation equations shows that, for the design year (proposed), the trips from home to work generated by each residential area per 24 hour as follows :  
A – 1000, B – 2250, C – 1750, D – 3200. There are 3700 jobs in industrial estate X and 4,500 in industrial estate Y. Attractions between zones are inversely proportional to square of journey times between zones. The journey times in minutes from home to work are :

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

Table Q7(b)

Calculate and tabulate the inter zonal trips for journey from home to work. (10 Marks)

**OR**

- 8 a. With the help of flow diagram explain the modal split carried out after trip distribution. (08 Marks)
- b. A market segment contains 600 individuals. A multinomial legit mode choice model is calibrated, resulting the following unity function  $u = a_k - 0.3 C - 0.02T$  where  $c$  = out of pocket cost in rupees,  $T$  – travel time in minutes,  $a_k$  – mode specific constant. The attributes, specific to each mode is given in the Table Q8(b). Predict the number of trips by each mode for this market segment.

| Mode | $a_k$ | C(Rs) | T(min) |
|------|-------|-------|--------|
| Bus  | 0     | 1.00  | 30     |
| Rail | 0.40  | 1.50  | 20     |
| Auto | 2.00  | 2.50  | 15     |

Table Q8(b)

(08 Marks)

**Module-5**

- 9 a. Explain in detail, various diversion curves used in trip assignment technique. (08 Marks)
- b. What is the purpose of trip assignment? Explain the minimum path tree method, in trip assignment technique. (08 Marks)

**OR**

- 10 a. With a flow chart, explain the fundamental structure of Lowry model. (08 Marks)
- b. List the various assignment techniques and explain all or Nothing method. (08 Marks)

\* \* \* \* \*



# CBCS SCHEME

USN

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

17CV71

## Seventh Semester B.E. Degree Examination, Jan./Feb. 2021 Municipal and Industrial Wastewater Engineering

Time: 3 hrs.

Max. Marks: 100

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

### Module-1

- 1 a. Classify the different sewerage systems and discuss the advantages and disadvantage of each system. (09 Marks)
- b. List the factors considered in determining the quantity of Dry Weather Flow. (04 Marks)
- c. Calculate the ratio of DWF and WWF of a city having the following particulars :  
Area = 50000 hectares , Water supply rate = 200 Lpcd , Population =  $20 \times 10^5$  ,  
Intensity of rainfall = 15mm/hour , Average impermeability factor = 0.5.  
80% of the water supplied reaches sewer. Comment on the result. (07 Marks)

OR

- 2 a. Explain with neat sketch laying of sewer line. (05 Marks)
- b. Mention the different types of Manholes and explain one of the Manholes, with neat sketch. (07 Marks)
- c. The drainage area of a town is 18 hectares. The surface of this area is

| Percent of total surface area | Types of surface | Coefficient of runoff |
|-------------------------------|------------------|-----------------------|
| 20 %                          | Hard pavement    | 0.85                  |
| 20 %                          | Roof surface     | 0.80                  |
| 15 %                          | Unpaved sheet    | 0.20                  |
| 30 %                          | Garden and Lawn  | 0.20                  |
| 15 %                          | Wooded area      | 0.15                  |

If the time and concentration for the area 40 minutes, find the maximum runoff. (08 Marks)

### Module-2

- 3 a. Calculate the velocity of flow and discharge in a sewer of circular section having a diameter of 1 in 500, when  $N = 0.012$  and the sewer is running half full. (08 Marks)
- b. With a neat sketch, explain Oxygen Sag Curve. (06 Marks)
- c. Explain the preventive measures required to be adopted for sewage sickness of land. (06 Marks)

OR

- 4 a. A waste water effluent of 560 L/s with a BOD = 65 mg/L , DO = 4.0 mg/L and temperature  $23^{\circ}\text{C}$  enters a river where the flow is  $28\text{m}^3/\text{sec}$  and the BOD = 4.0 mg/L. DO = 8.2mg/L and the temperature  $17^{\circ}\text{C}$ .  $K_1$  of the waste is 0.10 per day at  $20^{\circ}\text{C}$ . The velocity of water in the river downstream is 0.18m/s depth of 1.2m. Determine the following after mixing of waste water with river water : i) Combined discharge ii) BOD iii) DO iv) Temperature. (08 Marks)
- b. Explain the various techniques adopted in applying sewage effluents to farms. (06 Marks)
- c. Enumerate on dilution method Vs land disposal method for disposal of sewage. (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.



**Module-3**

- 5 a. The BOD of a sewage sample incubated 1 day at 30°C has been found to be 110mg/L. What will be 5 day at 20°C BOD, if  $K_{(20)} = 0.1/\text{day}$ ? (06 Marks)
- b. Draw the flow diagram of location of unit operations in a waste water treatment plant. (06 Marks)
- c. Design a rectangular grit chamber for a population of 2 lakhs, assuming per capita sewage = 120 L/day, quantity of grit at the rate of 25 L/min and velocity = 0.3m/sec and  $d = 0.2\text{mm}$ . (08 Marks)

**OR**

- 6 a. Design a circular sedimentation tank for the primary treatment of a sewage at 13.5 million lines per day. Check the surface loading. (06 Marks)
- b. List the advantages and disadvantages of activated sludge process. (08 Marks)
- c. Explain sludge digestion process with flow chart. (06 Marks)

**Module-4**

- 7 a. Explain the different techniques required to adopt strength reduction in industrial plant (any five). (10 Marks)
- b. List the various methods of removal of organic dissolved solids (any five). (10 Marks)

**OR**

- 8 a. Mention the advantages of the combined treatment. (08 Marks)
- b. Discuss the acceptable methods for neutralizing excess acidity or alkalinity in waste water. (08 Marks)
- c. Differentiate between effluent standards to stream standards. (04 Marks)

**Module-5**

- 9 a. Explain with a flow chart, the processes of cotton textile industry in manufacturing and the treatment methods adopted for waste water generated. (10 Marks)
- b. With a neat flow diagram, bring out the manufacturing process and sources of waste water generation from sugar cane industry. (10 Marks)

**OR**

- 10 a. Draw the flow sheet for waste water treatment in a large distillery complex by discussing the characteristics of waste. (10 Marks)
- b. For a paper and pulp industry discuss the various steps in generation of waste water during the manufacturing and treatment of the waste water before discharging on receiving water courses or sewers. (10 Marks)

\* \* \* \* \*



# CBCS SCHEME

USN

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

17CV72

## Seventh Semester B.E. Degree Examination, Jan./Feb. 2021 Design of RCC and Steel Structures

Time: 3 hrs.

Max. Marks: 100

- Note: 1. Answer any ONE full question from Module-1 and Module-2.  
2. Use of IS-456, IS-800, SP-6(1), SP-16 and Steel tables may be permitted.*

### Module-1

- 1 Design a cantilever retaining wall to retain earth embankment 4.0 m high above the average ground level. The density of soil is  $18 \text{ kN/m}^3$  and its angle of repose is  $30^\circ$ . The safe bearing capacity of the foundation soil may be taken as  $200 \text{ kN/m}^2$ . Coefficient of friction between soil and concrete may be taken as 0.5. Use M20 grade concrete and Fe-415 steel. Design all the components of the retaining wall with necessary checks and write a neat sketch of the cross section of the components showing reinforcement details. (50 Marks)

OR

- 2 Design a combined rectangular footing slab type for two columns A and B, carrying loads of 500 kN and 700 kN respectively. The cross section dimension of column 'A' is 300 mm  $\times$  300 mm and column 'B' is 400 mm  $\times$  400 mm. The width of the footing is restricted to 1.80 m. the centre to centre spacing of columns is 3.40 m. The safe bearing capacity of the foundation soil is  $150 \text{ kN/m}^2$ . Use M20 grade concrete and Fe-415 steel. The design must include all the necessary safety checks and write a neat sketch of the cross section of the components showing the reinforcement details. (50 Marks)

### Module-2

- 3 Design a simply supported welded plate girder for an effective span of 24.0 m. The plate girder is laterally supported for its entire length and it is subjected to an imposed service load of  $75 \text{ kN/m}$  which is inclusive of its self weight. The steel plates available is of Fe-410 grade. The design includes proportioning the dimensions of web and flange plate, section classification, check for bending and shear capacity of the section, design of welded connections and necessary stiffness along with check for deflection. Write a neat sketch of design details describing all the parts. (50 Marks)

OR

- 4 Design a steel roof truss with its geometry as shown in Fig.Q4. The analysed forces in the members due to dead load, live load and wind load are given in Table.Q4 for principal rafter, principal tie and for major sling member. Determine the maximum design forces due to load combinations as per IS-800 for the above mentioned members and design the same members with all the necessary checks including for reversal of stresses. Use 16 mm diameter bolt of grade 4.6 for the member end connections. Write a neat sketch of the design details describing all the parts. Steel section available is Fe-410 grade.



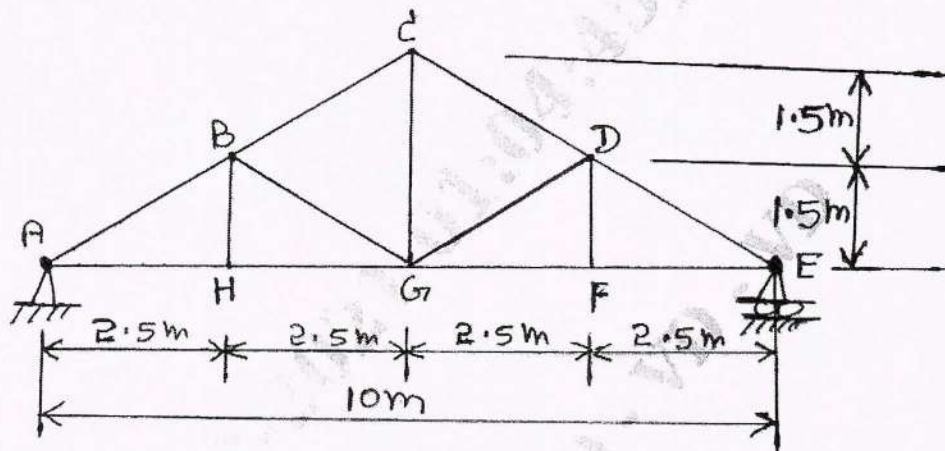


Fig.Q4

| Member      | Length (m) | Dead Load (kN) | Live Load (kN) | Wind Load (kN) |
|-------------|------------|----------------|----------------|----------------|
| Rafter (AB) | 2.92       | -58.0          | -52.5          | +111.6         |
| Tie (AH)    | 2.50       | +52.0          | +47.0          | -102.4         |
| Sling (BG)  | 2.92       | +20.3          | +18.4          | -63.0          |

Note: + → Tensile force

- → compressive force

Table.Q4

(50 Marks)

\*\*\*\*\*

# CBCS SCHEME

USN

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

17CV73

## Seventh Semester B.E. Degree Examination, Jan./Feb.2021 Hydrology and Irrigation Engineering

Time: 3 hrs.

Max. Marks: 100

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

### Module-1

- 1 a. List and explain the importance of hydrology. (10 Marks)  
 b. What is hydrological cycle? Explain with neat sketch, Horton's engineering representation of hydrological cycle. (10 Marks)

**OR**

- 2 a. What is Rain gauge? Explain with neat sketch non-recording types of rain gauge. (10 Marks)  
 b. The average annual rainfall of 6 rain gauge stations in a basin are 89, 68, 54, 45, 41 and 55 cm. If the error in the estimation of basin rainfall should not exceed 10%. How many additional rain gauges should be installed in the basin? (10 Marks)

### Module-2

- 3 a. What is evaporation? Explain the factors affecting evaporation. (10 Marks)  
 b. A reservoir had a average surface area of 20 km<sup>2</sup> during June. In that month the mean rate of inflow = 10 m<sup>3</sup>/sec. Mean outflow = 15 m<sup>3</sup>/sec monthly rainfall = 10 cm and change in storage = 16 million m<sup>3</sup>. Assuming the seepage losses to be 1.8 cm. Estimate the evaporation in that month. (10 Marks)

**OR**

- 4 a. Explain the process of methods to control evaporation from lakes. (10 Marks)  
 b. What are the factors affecting the infiltration? Explain with neat sketch double ring infiltrometer. (10 Marks)

### Module-3

- 5 a. What is runoff? List and explain the factors affecting on it. (10 Marks)  
 b. The following ordinates are of 3 hr unit hydrograph. Find out the volume of surface runoff from 1.5 cm effective rainfall of 3 hr duration.

|                           |   |     |      |    |      |    |      |     |     |    |    |
|---------------------------|---|-----|------|----|------|----|------|-----|-----|----|----|
| Time in (Hr)              | 0 | 6   | 12   | 18 | 24   | 30 | 36   | 42  | 48  | 54 | 60 |
| Unit Hydrograph ordinates | 0 | 5.1 | 21.6 | 27 | 23.5 | 17 | 10.7 | 6.2 | 3.2 | 1  | 0  |

(10 Marks)

**OR**

- 6 a. Define Hydrograph. With neat sketch explain component parts of hydrograph. (10 Marks)  
 b. Find out the ordinates of a storm hydrograph resulting from a 3 hr storm with rain fall of 3, 4.5 and 1.5 cm during subsequent 3 hr intervals. The ordinates of unit hydrograph are given in the table.

|              |   |    |     |     |     |     |     |     |     |    |    |    |    |
|--------------|---|----|-----|-----|-----|-----|-----|-----|-----|----|----|----|----|
| Hr           | 0 | 03 | 06  | 09  | 12  | 15  | 18  | 21  | 24  | 03 | 06 | 09 | 12 |
| OVH (cumecs) | 0 | 90 | 200 | 350 | 450 | 350 | 260 | 190 | 130 | 80 | 45 | 20 | 0  |

Assume an initial loss of 5 mm infiltration index of 5 mm/hr and base flow of 20 cumecs.

(10 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-4**

- 7 a. What is the necessity of irrigation in India and write benefits and ill effects of irrigation? (10 Marks)  
 b. Explain in detail system of irrigation. (10 Marks)

**OR**

- 8 a. What is irrigation frequency? Explain the factors affecting on frequency of irrigation. (10 Marks)  
 b. The gross commanded area for a distributor is 20000 hectares, 75% of which can be irrigated. The intensity of irrigation for Rabi season is 40% that for Kharif season 10%. If Kov period is 4 weeks for Rabi and 2.5 weeks for Kharif. Determine the out let discharge. Outlet factors for Rabhi and Kharif may be assumed as 1800 hectares/cumecs and 775 hectares/cumec. Also calculate delta for each crop. (10 Marks)

**Module-5**

- 9 a. Write the difference between Lacey's theory and Kennedy's theory. (10 Marks)  
 b. The slope of a channel in alluvial soil is  $s = \frac{1}{5000}$ , Lacey's silt factor  $f = 0.9$ . Channel side slope are  $\frac{1}{2}H : 1V$ . Find the channel section and maximum discharge which can be allowed to flow in it. (10 Marks)

**OR**

- 10 a. With a neat sketch, explain zones of storage in a reservoir. (10 Marks)  
 b. Explain Hydrologic investigation of reservoir planning? List the points to be consider for selection of site for a reservoir. (10 Marks)

\* \* \* \* \*

# CBCS SCHEME

USN

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

17CV742

## Seventh Semester B.E. Degree Examination, Jan./Feb. 2021 Ground Water and Hydraulics

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 importance of ground water. (06 Marks)  
b. Describe the vertical distribution of ground water with neat sketches. (10 Marks)  
c. Explain the Perched Aquifer with neat sketches. (04 Marks)

OR

- 2 a. Describe confined aquifer and unconfined aquifer with neat sketches. (12 Marks)  
b. Write a note on the following with examples:  
(i) Aquifers (ii) Aquiclude (iii) Aquifuge (iv) Aquitard (08 Marks)

### Module-2

- 3 a. What is storage coefficient? Explain its characteristics in confined and un-confined aquifers with neat sketches. (10 Marks)  
b. An artesian aquifer 20 m thick has a porosity of 20% and bulk modulus of compression  $10^8 \text{ N/m}^2$  estimate the storage coefficient of the aquifer. What fraction of this aquifer is attributed to the expansibility of water? (10 Marks)

OR

- 4 a. Describe Darcy's law with neat sketches. (08 Marks)  
b. In a phreatic aquifer extending over  $1 \text{ km}^2$  the water table was initially at 25 m below ground levels. Some time after irrigation with a depth of 20 cm of water the water table rose to a depth of 24 m below ground level, later  $3 \times 10^5 \text{ m}^3$  of water was pumped out and water table dropped to 26.2 m below ground level.  
(i) Determine the specific yield of the aquifer  
(ii) Deficit in soil moisture (below ground capacity) before irrigation (08 Marks)  
c. Differentiate between specific yield and specific retention. (04 Marks)

### Module-3

- 5 a. Describe the steady radial flow into a well in confined aquifer. (10 Marks)  
b. A 30 cm well fully penetrates a confined aquifer 30 m deep. After a long period of pumping at rate of 1200 litres per minute the draw down in the wells at 20 and 45m from the pumping well are found to be 2.2 and 1.8 m respectively. Determine the transmissibility of the aquifer. What is the drawdown in the pumped well? (10 Marks)

OR

- 6 a. Describe the unsteady radial flow into a well in unconfined aquifer. (10 Marks)  
b. A confined aquifer with transmissibility of  $1550 \text{ m}^2/\text{day}$  and storage coefficient of  $4.75 \times 10^{-4}$  is pumped at the rate of  $2880 \text{ m}^3/\text{day}$ . Determine the drawdown distribution around the pumping well. Find out the radius of influence after 1 day pumping. When four wells located 10 m away also operate simultaneous, what will be the additional drawdown? (10 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.



**Module-4**

- 7 a. Describe the ground water exploration using electrical resistivity method. (10 Marks)  
b. Explain the following:  
(i) Electrical logging (05 Marks)  
(ii) Radioactive logging (05 Marks)

**OR**

- 8 a. Describe the ground water exploration using Seismic method. (10 Marks)  
b. Describe the following:  
(i) Induction logging (05 Marks)  
(ii) Sonic logging (05 Marks)

**Module-5**

- 9 a. Explain the different types of deep bore wells. (10 Marks)  
b. Explain the parts of the Dug well with neat sketches. (05 Marks)  
c. Write a note on driven wells. (05 Marks)

**OR**

- 10 a. Describe the following:  
(i) Jetted wells (04 Marks)  
(ii) Groundwater run-off (04 Marks)  
b. Describe the different types of artificial ground water recharge methods. (12 Marks)

\* \* \* \* \*

# CBCS SCHEME

USN

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

17CV751

## Seventh Semester B.E. Degree Examination, Jan./Feb.2021 Urban Transportation and Planning

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 system approach to transport planning using a flowchart. (10 Marks)  
 b. What is Urbanization? State the causes of Urbanization. (10 Marks)

**OR**

- 2 a. What are the transportation problems? Explain briefly. (08 Marks)  
 b. Explain the classification of transit system with examples. (08 Marks)  
 c. Highlight the difference between Metro trains and BRTS. (04 Marks)

### Module-2

- 3 a. Define external Cordon line. What factors should be given due weightage in the selection of external Cordon line. (07 Marks)  
 b. What is zoning? Discuss the points to be kept in mind while doing zoning. (07 Marks)  
 c. Explain study area. List out the inventories of transport facilities, Explain any two. (06 Marks)

**OR**

- 4 a. Mention the different types of transport surveys that are to be carried out? Explain briefly. (09 Marks)  
 b. List out the use of secondary sources. Explain. (05 Marks)  
 c. What is Sampling? Discuss various types of Samplings. (06 Marks)

### Module-3

- 5 a. List the methods available for trip distribution for future. Explain any two methods. (06 Marks)  
 b. What is multiple linear regression analysis? Mention the assumptions made. (06 Marks)  
 c. The following Fig. Q5 (c) shows trip distribution for the base year.

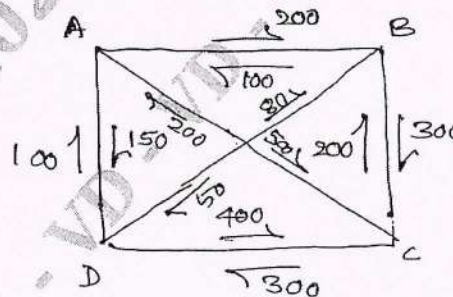


Fig. Q5 (c)

The origin and destination growth factor are as follows:

| GF          | Zone |     |   |     |
|-------------|------|-----|---|-----|
|             | A    | B   | C | D   |
| Origin      | 3    | 2.5 | 2 | 1.6 |
| Distination | 1.2  | 1.5 | 3 | 2.4 |

Distribute the trips for the horizon year using furness 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 in detail the factors governing trip generation and attraction rates. (08 Marks)  
 b. Mention the assumptions made in category analysis. (05 Marks)  
 c. The following data shows average household size and total trips made per day for a particular zone of study area. Develop the trip distribution equation and also compute the coefficient of correlation.

| Average household size | Total trips per day |
|------------------------|---------------------|
| 2                      | 4                   |
| 3                      | 6                   |
| 4                      | 7                   |
| 5                      | 8                   |
| 6                      | 10                  |

(07 Marks)

**Module-4**

- 7 a. What are the factors affecting modal split? Explain briefly. (08 Marks)  
 b. Draw the flow diagram for modal split carried out between trip generation and trip distribution. (06 Marks)  
 c. Differentiate between "trip end" and trip "interchange" of modal split. Specify variables used, explain any two variables. (06 Marks)

OR

- 8 a. Write a short note on opportunity models. (06 Marks)  
 b. Explain in detail the opportunity model relating to synthetic method. (06 Marks)  
 c. The total trips produced in and attracted to the three zones A, B and C of a survey area in the design year are tabulated as,

| Zone | Trip produced | Trip attracted |
|------|---------------|----------------|
| A    | 2000          | 3500           |
| B    | 3500          | 4800           |
| C    | 4800          | 2000           |

It is known that the trip between two zones are inversely proportional to the second power of the travel time between zones, which is 25 minutes. If the trip interchange between zones B and C is 300. Calculate the trip interchange between zones A and B, A and C, B and A, C and B. (08 Marks)

**Module-5**

- 9 a. List the various assignment techniques and explain briefly. (08 Marks)  
 b. Explain the application of the traffic assignment. (06 Marks)  
 c. Briefly explain coding, route properties. (06 Marks)

OR

- 10 a. Discuss the points for the selection of Land use transport model. (10 Marks)  
 b. Write a flow chart of fundamental structure of Lowry model and explain principal components of the model. (10 Marks)

\*\*\*\*\*



# CBCS SCHEME

USN

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

15CV71

## Seventh Semester B.E. Degree Examination, Jan./Feb. 2021 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. Any missing data can be assumed.

### Module-1

- 1 a. Define Dry Weather Flow. Explain the factors influencing DWF. (05 Marks)  
b. Differentiate between conservancy system and water carriage system. (05 Marks)  
c. Calculate the quantity of sewage for separate and partially separate system for a town given the following data:  
i) Area of the town – 250 hectares  
ii) Intensity of rain fall – 50mm/hr  
iii) Population density – 300 person/hectare  
iv) Rate of supply – 250/pcd  
v) Peak factor – 2.0  
vi) Surface classification

| Type of surface   | % Area | Run off coefficient |
|-------------------|--------|---------------------|
| Roofs             | 50%    | 0.9                 |
| Paved surface     | 20%    | 0.85                |
| Non paved surface | 30%    | 0.30                |

Assume 80% of the water supplied reaches the sewer. (06 Marks)

### OR

- 2 a. Explain the desirable characteristics of a sewer material. (05 Marks)  
b. Write a note on ventilation of sewers. (05 Marks)  
c. Develop a relationship between a diameter of the circular section of a sewer and a side of the rectangular sewer section having width as twice its depth the three sides are wetted. (06 Marks)

### Module-2

- 3 a. Explain self purification phenomenon with a neat sketch of oxygen sag curve. (05 Marks)  
b. Explain self cleaning velocity and non sourcing velocity. (05 Marks)  
c. Design a sewer to a population of 60,000 the rate of water supply is 135/pcd. The slope available for the sewer to be laid is 1 in 625 and the sewer should be designed to carry four times the DWF when running full. What would be the velocity of flow? Take  $N = 0.012$ . (06 Marks)

### OR

- 4 a. Explain: i) Sewage farming ii) Sewage sickness. (08 Marks)  
b. Explain the methods of sewage disposal i) By dilution ii) By land treatment. (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.



**Module-3**

- 5 a. Derive an expression for first stage BOD with usual notations. (06 Marks)  
b. Define the terms BOD and COD. (04 Marks)  
c. The 5 day BOD @ 20°C of a sewage sample was found to be 100mg/l. Calculate 2 day BOD at 30°C for the same sample,  $K_{20} = 0.1/\text{day}$ . (06 Marks)

**OR**

- 6 a. Write a detailed flow diagram of a sewage treatment plant for a large city. Indicate the components. (06 Marks)  
b. With a neat sketch, explain working principle of activated sludge process. (06 Marks)  
c. Mention the operational problems of trickling filter process. (04 Marks)

**Module-4**

- 7 a. Discuss in detail the impact of industrial wastewater on water bodies. (08 Marks)  
b. Briefly explain strength reduction strategy for an industrial effluent concerned with waste treatment. (08 Marks)

**OR**

- 8 a. List the techniques applied in removal of suspended solids. Explain any two methods. (08 Marks)  
b. Briefly explain the circumstances under which joint treatment of domestic wastewater and industrial wastewater is recommended. (08 Marks)

**Module-5**

- 9 Explain briefly the characteristics and treatment of cane sugar mill effluent with the aid of a flow chart. (16 Marks)

**OR**

- 10 a. Explain the sources and characteristics of tannery wastewater with the help of flow diagram. (10 Marks)  
b. Explain in brief the effect of dairy waste in receiving streams. Also propose a treatment for dairy wastewater. (06 Marks)

\*\*\*\*\*

# CBCS SCHEME

USN

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

15CV72

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021

## Design of RCC and Steel Structures

Time: 3 hrs.

Max. Marks: 80

- Note:** 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. Use of IS456-2000 and SP16, IS800, -steel tables is permitted.

### Module-1

- 1 Design RCC rectangular combined footings for two columns which are 3.6m apart carrying a load of 1000kN and 1500kN. Sizes of column are 400mm × 400mm and 600 × 600mm. Width of footing is 1.8m SBC of soil is 280 kN/m<sup>2</sup>. M20 concrete and Fe415 steel is used. Assume beam and slab type combined footing sketch the details of Reinforcement. (40 Marks)

OR

- 2 RCC hall 10m wide 20m long is provided with portal frame 4m c/c. Frame are fixed at bottom. Heights of columns are 16.5m. Live load = 1.5 kN/m<sup>2</sup> SBC = 120 kN/m<sup>2</sup>. Design the slabs, portal Frame, column and footing using M20 concrete and Fe 415 steel. Sketch details of reinforcement. (40 Marks)

### Module-2

- 3 Design a plate girder for an effective span 14m. Load on the girder consist of UDL 45 kN/m in addition to two point loads each of magnitude 400kN placed at a distance of 3m, on either side of mid span point of girder, Design Mid span cross section curtailment of flange, Intermediate stiffness and end bearing stiffness. Draw sketch showing detail of longitudinal section cross section at mid span and support and plan of girder. (40 Marks)

OR

- 4 Design a gantry girder for a span 25m column spacing = 8m, Wheel base = 3.5m, Crane capacity = 200kN, Weight of crane bridge = 150 kN, Weight of trolley crab = 75kN, Min hook distance = 1m, Weight of rail = 0.3 kN/m, height of rail = 105mm. Draw suitable sketch showing details of cross section, Longitudinal section and plan. (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.



# CBCS SCHEME

USN

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

15CV73

## Seventh Semester B.E. Degree Examination, Jan./Feb.2021 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. Explain Global and India water availability. (07 Marks)  
b. Explain with neat sketch an engineering representation of hydrologic cycle. (09 Marks)

**OR**

- 2 a. What is precipitation? Explain different forms of precipitation. (09 Marks)  
b. The average rainfall of 5 rain gauges in the base stations are 890, 540, 450, 410 and 550 mm. If the error in the estimation of rain fall should not exceed 10%, how many additional gauges may be required? (07 Marks)

### Module-2

- 3 a. List the factors affecting evaporation. (05 Marks)  
b. Describe the ISI standard evaporation pan with a neat sketch. (07 Marks)  
c. What is the evaporation, if 4.75 litres of water is removed from an evaporation pan of diameter 1.22 m and the simultaneous rainfall measurement is 8.8 mm? (04 Marks)

**OR**

- 4 a. Describe how infiltration capacity rate can be measured using a double ring infiltrometer. (08 Marks)  
b. Define  $\phi$ -index and W-index. (04 Marks)  
c. In the month of November for a particular place, monthly percentage of hours of bright sunshine 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 Balney-Criddle method. (04 Marks)

### Module-3

- 5 a. What is runoff? Discuss the factors affecting the runoff. (10 Marks)  
b. Explain with sketches different shapes of catchment. (06 Marks)

**OR**

- 6 a. What are the components of hydrographs? Explain how base flow is separated from a hydrograph. (06 Marks)  
b. What is unit hydrograph? What are the assumptions made in derivation of UH theory. (04 Marks)  
c. What are the uses and applications of unit hydrograph? (06 Marks)

### Module-4

- 7 a. What is irrigation? What are the advantages and disadvantages of irrigation? (08 Marks)  
b. Explain Bandhara Irrigation with a sketch. Give briefly the advantages and disadvantages of bandhara Irrigation. (08 Marks)

OR

- 8 a. Explain the terms duty, delta and base period. Derive a relation ship between the two for a given base period. (08 Marks)
- b. If the depth of water stored at 5 points in a field are 1.0, 0.9, 0.8, 0.7 and 0.6 m. Determine the water distribution efficiency. (04 Marks)
- c. (i) Find the delta of crop if the duty is 1800 ha/cumec and the base period is 130 days.  
 (ii) What would be the duty if the delta is increased by 20% and the base period reduced by 10 days? (04 Marks)

**Module-5**

- 9 a. What is Canal? What are the different types of canals? (06 Marks)
- b. Explain with a sketch Ridge canal or water shed alignment of canals. (06 Marks)
- c. Define the following terms:  
 (i) Gross command area  
 (ii) Cultural command area.  
 (iii) Any two difference between lined and unlined canals. (04 Marks)

OR

- 10 a. The slope of the channel in aluminum is  $\frac{1}{4000}$ , Lacey's silt factor is 0.9 and side slope are  $\frac{1}{2}(H):1(V)$ . Find the channel section and maximum discharge which can be allowed to flow in it. (08 Marks)
- b. Briefly explain :  
 (i) Investigation for reservoir site.  
 (ii) Economic height of a dam. (08 Marks)

\*\*\*\*\*



# CBCS SCHEME

USN

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

15CV741

## Seventh Semester B.E. Degree Examination, Jan./Feb. 2021 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 IRC-6, IRC-21, IRC-112, IS458-1988 is permitted.  
3. Missing data may be assumed suitably.*

### Module-1

- 1 a. Briefly explain the following term related to bridge engineering atleast with one relevant formula for each.  
(i) Afflux (ii) Scour (06 Marks)  
b. Derive the condition of Economic Span of bridge. (10 Marks)

### OR

- 2 a. What is impact factor, briefly explain the impact allowances in IRC class A loading. (06 Marks)  
b. Determine the waterway for the bridge across a stream with flood discharge of  $225 \text{ m}^3/\text{s}$ , velocity 1.5 m/s and width of flow at high level in 60m, the allowable velocity under the bridge is 1.8 m/s. (10 Marks)

### Module-2

- 3 Design a reinforced concrete slab culvert for national highway over a stream crosses a road at an angle of  $90^\circ$ . The design datas are as follows:  
Carriage way (two lane) = 7.5 m  
Footpath = 1m on Either side  
Clear span = 6m  
Wearing coat = 80mm  
Width of bearing = 400mm  
Material :  $M_{25}$  grade concrete and Fe-415, HYSD Bars  
Loading : IRC class AA tracked vehicle. (16 Marks)

### OR

- 4 Design the Skew slab culvert to suit the following data:  
Clear span = 6 m, Skew angle =  $10^\circ$ , Width of carriage way = (Two lane) = 7.5 m  
Wearing coat = 80 mm, Width of bearing = 400mm.  
Material :  $M_{25}$  grade concrete, Fe 415 HYSD Bars  
Loading : IRC class AA tracked vehicle. (16 Marks)

### Module-3

- 5 Design the cantilever slab of 'T' beam bridge for the following data:  
Width of road way = 7.5m  
Width of kerb = 0.6m  
Depth of kerb = 0.3m  
No. of longitudinal girder = 3  
Spacing of longitudinal girder = 2.5m  
Thickness of wearing coat = 80mm  
Type of loading : IRC class A wheel load  
Materials :  $M_{20}$  grade concrete, Fe-415 HYSD Bars. (16 Marks)

OR

- 6 Design the longitudinal girder of the 'T' beam bridge for following data by using Courbon's method for reaction factor:  
 Number of longitudinal girder = 3  
 Spacing of longitudinal girder = 3 m  
 Spacing of cross girders = 3.5m  
 Loading from cantilever portion from two sides = 31.32 kN.  
 Loading from deck = 41.32 kN  
 Span of the bridge = 14 m  
 Material :  $M_{40}$  grade concrete, Fe 415 Steel  
 Loading : IRC class AA tracked vehicle. (16 Marks)

Module-4

- 7 Design a box culvert having inside dimension of  $3\text{m} \times 3\text{m}$ . This culvert is subjected to a dead load of  $14000 \text{ N/m}^2$  and live load of IRC-class AA tracked vehicle. Assume the unit weight of the soil to be  $18000 \text{ N/m}^3$ , the angle of repose of the soil is  $30^\circ$ . The culvert is to be designed for particular case when dead load and live load acting from outside while no water pressure inside. The width of road is 7.5m and span is 3.3m. Use  $M_{25}$  grade concrete and Fe-415 HYSD Bars. (16 Marks)

OR

- 8 Design a pipe culvert through a road embankment of height 6m. The width of road is 7.5m and the formation width is 10m. The side slope of the embankment is 1.5:1. The maximum discharge is  $5 \text{ m}^3/\text{s}$ . The safe velocity is  $3 \text{ m/s}$ . Assume bellmouth entry. Consider loading as IRC-class AA tracked vehicle. Given  $C_e = 1.5$ ,  $C_s = 0.010$  and unit weight of soil is  $20 \text{ kN/m}^3$ . (16 Marks)

Module-5

- 9 A stone masonry abutment used for highway bridge having bottom width of 2 m and top width of 1m. The height of the abutment is 3m. The vertical load is 15 kN, the live load and dead load being 20 kN acting at  $1/3^{\text{rd}}$  of the height from the base. SBC of soil is  $150 \text{ kN/m}^2$ . Coefficient of friction is 0.5, the density of stone masonry is  $25 \text{ kN/m}^3$ . Compute the stress developed at the base and check the stability of the abutment. (16 Marks)

OR

- 10 a. List the types of Expansion bearing. Briefly explain any one with neat sketch. (08 Marks)  
 b. List the types of expansion joints used in bridges and briefly explain any one with neat sketch. (08 Marks)

\*\*\*\*\*



6

# CBCS SCHEME

USN

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

15CV742

**Seventh Semester B.E. Degree Examination, Jan./Feb. 2021**

## Ground Water 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. Write a note on importance of ground water. (08 Marks)
- b. Explain briefly occurrence of ground water in different rocks and soils. (08 Marks)

OR

- 2 a. With the help of neat sketches, explain i) Unconfined ii) Confined and iii) Perched aquifer. (08 Marks)
- b. With the help of a neat sketch, explain Vertical distribution of ground water. (08 Marks)

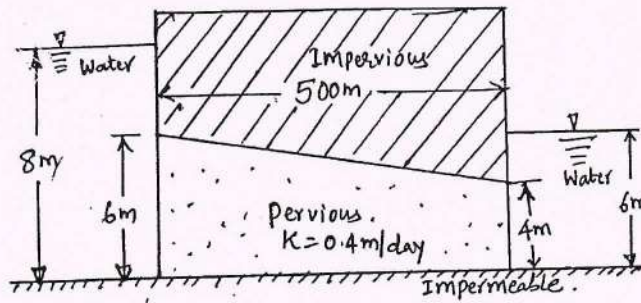
### Module-2

- 3 a. State and explain Darcy's law. Explain its validity and limitations. (08 Marks)
- b. It was observed in a field test that 3 hour 30 minutes 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 Reynold's number for the flow, assuming an average grain size of 1mm and kinematic viscosity of water as 0.008 stokes. (08 Marks)

OR

- 4 a. Define i) Storage coefficient ii) Transmissibility iii) Permeability and iv) Intrinsic permeability. (08 Marks)
- b. What is the flow rate in the confined aquifer shown in fig. Q4(b). Take width = 800m. (08 Marks)

Fig.Q4(b)



### Module-3

- 5 a. Explain Cooper – Jacob method to determine storage coefficient and transmissivity of aquifer. (08 Marks)
- b. A gravity well has a diameter of 60cm. The depth of water in the well is 40 meters before pumping is started. When pumping is being done at the rate of 2000 litres per minute, the drawdown in a well 10 meters away is 4 meters and in another 20 meters away is 2 meters. Determine i) Radius of zero drawdown ii) Coefficient and Permeability and iii) Drawdown in the well. (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. Derive an expression for discharge from a well penetrated in a confined aquifer. (08 Marks)  
 b. A well fully penetrating a confined aquifer is pumped at a uniform rate of 2500 litres per minute. The draw downs in an observation well situated at 60m away are given in table below. Determine formation constants of aquifer. Use Cooper – Jacob method. (08 Marks)

| Time (min)   | 0   | 1.50 | 3.00 | 6.0  | 10.0 | 18.00 | 40.00 | 80.00 | 120.00 | 180.00 | 240  |
|--------------|-----|------|------|------|------|-------|-------|-------|--------|--------|------|
| Draw down(m) | 0.0 | 0.26 | 0.36 | 0.48 | 0.56 | 0.66  | 0.80  | 0.91  | 0.98   | 1.05   | 1.10 |

**Module-4**

- 7 a. With the help of a neat sketch, explain Seismic Refraction method. (08 Marks)  
 b. With the help of a neat sketch, explain radioactive logging. (08 Marks)

OR

- 8 a. Explain Electrical Resistivity method of ground water exploration. (08 Marks)  
 b. Explain briefly i) Sonic Logging and ii) Induction Logging. (08 Marks)

**Module-5**

- 9 a. With the help of a neat sketch, explain Strainer type tube well. (08 Marks)  
 b. What are the objectives and benefits of artificial ground water recharge? (08 Marks)

OR

- 10 a. With the help of a neat sketch, explain working of a submersible pump. (08 Marks)  
 b. Explain ground water recharge using : i) Check dams and ii) Farm ponds. (08 Marks)

\* \* \* \* \*



# CBCS SCHEME

USN

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

15CV751

## Seventh Semester B.E. Degree Examination, Jan./Feb. 2021 Urban Transportation and Planning

Time: 3 hrs.

Max. Marks: 80

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

### Module-1

- 1 a. Explain Briefly, the need and role of metro rail transportation with its relative advantages. (08 Marks)  
b. List the various urban traffic and transport problems in India. (08 Marks)

OR

- 2 a. Compare the mass, public and private transport systems, in detail. (08 Marks)  
b. Explain briefly, the various stages involved in urban transport planning process. (08 Marks)

### Module-2

- 3 a. Define zone. Mention the different factors considered in dividing the whole area into zones. (08 Marks)  
b. List various surveys required to collect data in urban transport planning and explain home interview survey, in detail. (08 Marks)

OR

- 4 a. Briefly explain, the expansion of data from samples and expansion factors used in urban transport planning. (06 Marks)  
b. Explain with sketch, various basic movements in transportation survey. (05 Marks)  
c. Explain four important factors considered while selecting external cordon line. (05 Marks)

### Module-3

- 5 a. Explain the various factors governing trip generation and trip attraction. (06 Marks)  
b. List the various assumptions considered in category analysis. (05 Marks)  
c. Explain multiple linear regression analysis. (05 Marks)

OR

- 6 a. Briefly explain Furness method, with its advantages and disadvantages. (06 Marks)  
b. The table below gives data for vehicle trips/day, income and persons in a household for one of the study area. Develop the trip generation equations between income and household persons. Indicate which one is more reliable and why?

|                     |   |    |    |    |    |    |
|---------------------|---|----|----|----|----|----|
| Income (lakhs/year) | 5 | 10 | 15 | 20 | 25 | 30 |
| Persons/ household  | 4 | 6  | 8  | 9  | 8  | 6  |
| Trips/day           | 5 | 6  | 8  | 4  | 4  | 6  |

(10 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-4**

- 7 a. Explain the various factors governing modal split. (06 Marks)
- b. A self contained town consists of four residential areas A, B, C and D and two intermediate estates X and Y. Generation equations shows that, for the design year (proposed), the trips from home to work generated by each residential area per 24 hour as follows :  
A – 1000, B – 2250, C – 1750, D – 3200. There are 3700 jobs in industrial estate X and 4,500 in industrial estate Y. Attractions between zones are inversely proportional to square of journey times between zones. The journey times in minutes from home to work are :

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

Table Q7(b)

Calculate and tabulate the inter zonal trips for journey from home to work. (10 Marks)

**OR**

- 8 a. With the help of flow diagram explain the modal split carried out after trip distribution. (08 Marks)
- b. A market segment contains 600 individuals. A multinomial legit mode choice model is calibrated, resulting the following unity function  $u = a_k - 0.3 C - 0.02T$  where  $c =$  out of pocket cost in rupees,  $T =$  travel time in minutes,  $a_k =$  mode specific constant. The attributes, specific to each mode is given in the Table Q8(b). Predict the number of trips by each mode for this market segment.

| Mode | $a_k$ | C(Rs) | T(min) |
|------|-------|-------|--------|
| Bus  | 0     | 1.00  | 30     |
| Rail | 0.40  | 1.50  | 20     |
| Auto | 2.00  | 2.50  | 15     |

Table Q8(b)

(08 Marks)

**Module-5**

- 9 a. Explain in detail, various diversion curves used in trip assignment technique. (08 Marks)
- b. What is the purpose of trip assignment? Explain the minimum path tree method, in trip assignment technique. (08 Marks)

**OR**

- 10 a. With a flow chart, explain the fundamental structure of Lowry model. (08 Marks)
- b. List the various assignment techniques and explain all or Nothing method. (08 Marks)

\* \* \* \* \*