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 = 20×10^5 ,
   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 23^0C enters a river where the flow is 28m^3/sec and the BOD = 4.0 mg/L, DO = 8.2mg/L and the temperature 17^0C. K_1 of the waste is 0.10 per day at 20^0C. 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 forms. **(06 Marks)**
   c. Enumerate on dilution method Vs land disposal method for disposal of sewage. **(06 Marks)**

Module-3

5 a. The BOD of a sewage sample incubated 1 day at 30^0C has been found to be 110mg/L. What will be 5 day at 20^0C BOD, if $K_{(20)} = 0.1$/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 = 0.2mm. **(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)**

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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 kN/m³ and its angle of repose is 30°. The safe bearing capacity of the foundation soil may be taken as 200 kN/m². 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 dafe bearing capacity of the foundation soil is 150 kN/m². 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.
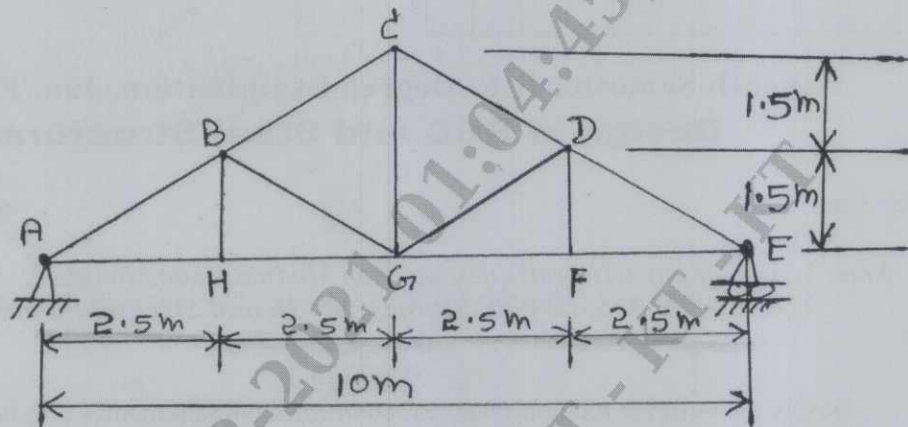
Fig.Q4

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)

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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^2 during June. In that month the mean rate of inflow = 10 m^3/sec. Mean outflow = 15 m^3/sec, monthly rainfall = 10 cm and change in storage = 16 million m^3. 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)

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 $s = \dfrac{1}{5000}$. Lacey's silt factor $f = 0.9$. Channel side slope are $\dfrac{1}{2}H:1V$. 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)

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17CV741

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

Time: 3 hrs.

Max. Marks: 100

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 IS-458, Pigeaud's curves are permitted.
3. Assume any missing data suitably.

Module-1

1 a. Define a bridge. How the bridges are classified? Explain briefly. **(10 Marks)**
   b. Mention the various methods of estimating the maximum discharge in the stream and explain any three methods. **(10 Marks)**

OR

2 a. What is meant by economical span of a bridge? Derive the equation of a economical span by stating the assumptions made. **(10 Marks)**
   b. A bridge needs to be constructed across an alluvial stream having a discharge of 500 cumecs. Calculate the depth of maximum scour when the bridge consists of:
   (i) Three spans of 15m each
   (ii) Two spans of 30m each
   (iii) Four spans of 30m each
   Take silt factor as 1.1. **(10 Marks)**

Module-2

3 Design a reinforced concrete deck slab bridge for a National Highway to suit the following data:
   Width of the carriage way = 7.5 m (two lane traffic)
   Foot path on either side = 1.0 m
   Clear span = 6.0 m
   Wearing coat = 80 mm
   Width of bearing = 400 mm
   Materials = M30 grade concrete and steel Fe-415 HYSD bars
   Loading: IRC class-A.
   The design should confirm to the new code specifications using limit state method. Check for shear and design of foot path is not necessary. **(20 Marks)**

OR

4 Design a reinforced skew deck slab for a National Highway crossing of a stream to suit the following data:
   Width of carriage way = 7.5 m; Foot path on either side = 1.0 m; Clear span = 6.0 m; Wearing coat = 80 mm; Width of bearing = 370 mm; Skew angle = 30°; Materials: concrete: M-25 grade and steel Fe-415 grade HYSD bars; Depth of the slab = 540 mm ; Loading IRC – Class AA loading tracked vehicle. The design should confirm to the new code specifications using limit state method. Check for shear and design of foot path is not necessary. **(20 Marks)**

Module-3

5 Design the deck slab only for the T-beam bridge for the following data:
Effective span = 16m,
Loading: IRC class AA tracked vehicle
Materials: M-25 grade concrete and steel Fe-415
Spacing of the cross girders = 4m c/c
Width of carriage way = two lane 7.5 m
Thickness of the wearing coat = 80 mm
Kerbs on either side = 600 mm × 300 mm deep
Width of the main girder = 300 mm
Width of the cross girder = 300 mm
Spacing of main girder = 2.5 m c/c
Width of cross girder = 300 mm   (20 Marks)

OR

6 Design a T-beam bridge 'main girder' for the same data given in Q5.   (20 Marks)

Module-4

7 Design a pipe culvert through a road embankment of height 6m, the width of the road is 7.5 m and the formation width is 10 m, the side slope of the embankment is 1.5:1. The maximum discharge is 5 m^3/sec. The safe velocity is 3 m/sec Class A-A, tracked vehicle is to be considered as a live load. Assume Bell mouthed entry. Given K_e = 0.08, C_e = 1.5, C_s = 0.010 and density of soil is 20 kN/m^3. Internal diameter of the pipe is 1000 mm and external diameter of the pipe is 1230 mm. Three edge bearing strength is 71.85 kN/m. Spiral reinforcement is 21.52 kg/m. Longitudinal reinforcement is 2.66 kg/m. Draw the reinforcement details of the pipe and type of foundation bed.   (20 Marks)

OR

8 Explain in detail the design principles of box culvert.   (20 Marks)

Module-5

9 a. Mention the various forces acting on the pier.   (05 Marks)
   b. Explain the different types of abutment with sketches.   (08 Marks)
   c. Compute the stresses developed at the base and check for the stability of the abutment as shown in Fig.Q9(c). SBC of soil is 150 kN/m^2. Coefficient of friction between masonry and soil is 0.5, density of stone masonry is 25 kN/m^3.

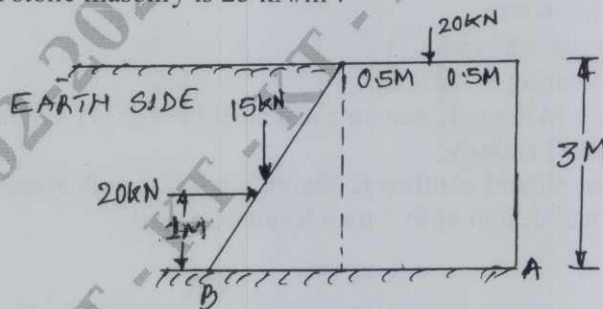Fig.Q9(c)   (07 Marks)

OR

10 a. Mention the different types of bearings. Explain with neat sketches for any two types of bearings used in bridge.   (08 Marks)
   b. What are the points to be considered in the selection of suitable bridge bearings?   (04 Marks)
   c. What are the functions of an expansion joint? Explain any two types with sketches.
                                                                         (08 Marks)

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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)**
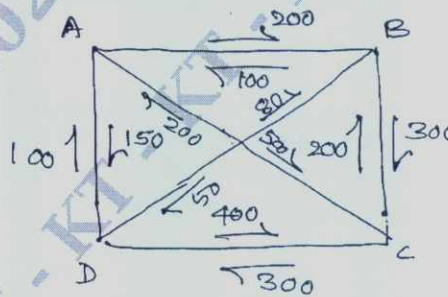   c. The following Fig. Q5 (c) shows trip distribution for the base year.

Fig. Q5 (c)

The origin and distination 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)**

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 "intercharge" 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)

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