

CBCS SCHEME

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15CV71

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

Time: 3 hrs.

Max. Marks: 80

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

Module-1

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

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

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

OR

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

Module-2

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

OR

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

Module-3

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

OR

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

Module-4

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

OR

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

Module-5

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

OR

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

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15CV72

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

Time: 3 hrs.

Max. Marks: 80

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

Module-1

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

OR

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

Module-2

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

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

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

Sign :- + ⇒ Compression

- ⇒ Tension

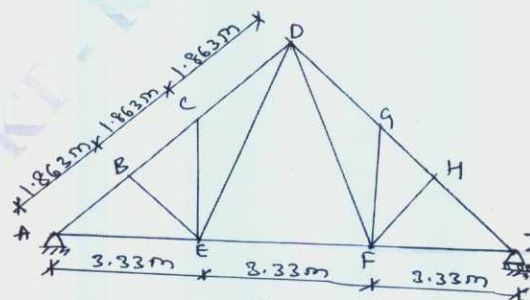


Fig.Q3

1 of 2

(40 Marks)

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

OR

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

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

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

(40 Marks)

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15CV73

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

Time: 3 hrs.

Max. Marks: 80

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

Module-1

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

OR

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

Module-2

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

OR

- 4 a. Describe the method of determining infiltration capacity using a double ring infiltrometer. (06 Marks)
- b. A reservoir with average surface spread of 4.8 km² in the first week of November has the water surface temperature of 30°C and relative humidity of 40%. Wind velocity measured at 3.0m above the ground is 18km/h. The mean barometer reading is 760mm of Hg. Calculate the average evaporation loss from the reservoir in mm/day and the total depth and volume of evaporation loss in the first week of November. Use both Meyer's equation as well as Rohwer's equation. Take saturation vapour pressure at 30°C as 31.81mm of Hg. (10 Marks)

Module-3

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

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

(06 Marks)

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

OR

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

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

Module-4

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

OR

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

Module-5

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

OR

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

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

Find also the longitudinal slope. (08 Marks)

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15CV741

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

Design of Bridges

Time: 3 hrs.

Max. Marks: 80

- Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of codes IRC-6, IRC-21, IRC-112, IS-456, SP-16 and Pigeaud's curves are permitted.*

Module-1

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

OR

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

Module-2

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

OR

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

Module-3

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

OR

- 6 A T-beam bridge has the following data:
 Effective span = 16.0 m
 Clear carriage way = 7.5 m
 Longitudinal main girders = 3 Nos@2.5m c/c
 Cross girders = 5 Nos@4.0 m c/c
 Kerbs at both the ends = 600 mm wide
 300 mm deep.
 Thickness of deck slab = 200 mm
 Thickness of wearing coat = 80 mm
 Live load – class AA tracked vehicle
 Grade of concrete – M30
 Grade of steel – Fe415
 Design and detail the outer main girder of the T-beam bridge. (16 Marks)

Module-4

- 7 A single vent box culvert has internal dimensions 3.0m × 3.0m with the following data:
 Superimposed dead load = 16.0 kN/m²
 Live load including impact = 52.0 kN/m²
 Insitu intensity of soil = 18.0 kN/m³
 Angle of internal friction = 30 degrees
 Considering empty condition, Design and detail the box culvert using M30 Grade concrete and Fe 415 grade steel. (16 Marks)

OR

- 8 Design and detail a pipe culvert for the following data:
 Catchment area = 12.0 sq. km
 Maximum daily rainfall = 25 mm
 Runoff coefficient = 0.8
 Clear road width = 7.5 m
 Footpath on either side = 600 mm
 Bed level of stream = 50.0 m
 Road formation level = 53.0 m
 Weight of earthfill = 74 kN/m
 Influence coefficient $C_s = 0.036$
 Impact factor = 1.5
 Loading – Class A vehicle with 114 kN use NP₃ pipes with longitudinal reinforcement 3.55 kg/m, spiral reinforcement 46.21 kg/m and a 3 Edge bearing strength of 100.6 kN/m. (16 Marks)

Module-5

- 9 a. What are the forces acting on piers? (04 Marks)
 b. Sketch typical types of piers used in bridges. (06 Marks)
 c. Write short notes on stability of abutments. (06 Marks)

OR

- 10 a. With neat sketches, explain different types of bearings used in bridges. (10 Marks)
 b. Explain why expansion joints are required on bridge deck slabs. (04 Marks)
 c. Detail a typical expansion joint in the deck slab of a concrete bridge. (02 Marks)

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15CV751

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

Time: 3 hrs.

Max. Marks: 80

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

Module-1

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

OR

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

Module-2

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

OR

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

Module-3

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

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

OR

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

O \ D	1	2	3	T_i
1	60	100	200	360
2	100	20	300	1260
3	200	300	20	3120

Table Q6(b)

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

Table Q6(c)

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

(03 Marks)

Module-4

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

OR

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

A	B	C	D
1000	2250	1750	3200

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

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

Calculate and tabulate the inter zonal trips for journeys from home to work.

(16 Marks)

Module-5

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

OR

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