

# CBCS SCHEME

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18CV821

**Eighth Semester B.E. Degree Examination, June/July 2023**

## Bridge Engineering

Time: 3 hrs.

Max. Marks:100

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

**2. Use of IRC : 6, IRC : 6, IRC : 21, IS456, SP16, IS458, IS783 and Pigeaud's chart are permitted.**

### Module-1

1 a. Explain the following terms :

- Highest flood level
- Catchment area
- Design discharge
- Afflux
- Economical span.

(05 Marks)

b. The cross section of a stream is shown in Fig.Q1(b). The average bed fall of the stream is 1 : 1600. Determine the maximum discharge. Take Manning's coefficient as 0.025 and HFL = 83.80.

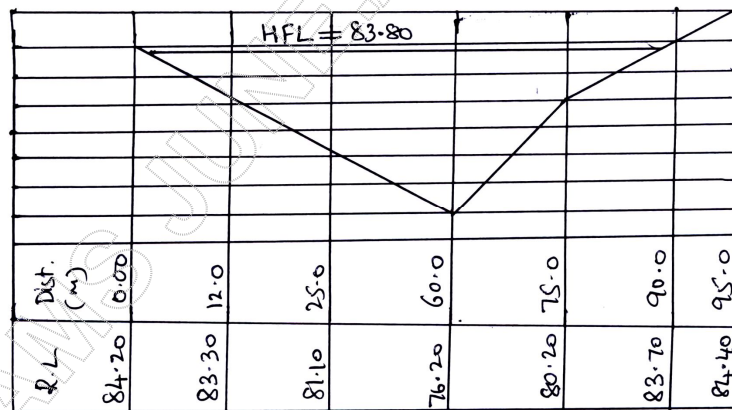


Fig. Q1(b)

(15 Marks)

OR

2 a. Explain IRC live loads for bridges.

(06 Marks)

b. What are the factors considered in selection of bridge site?

(06 Marks)

c. Calculate the maximum flood discharge at a river bridge site by Area – velocity method. The catchment area is about 135 sq.km. Located 30km from the coast. The bed levels at the cross-section at bridge site taken from left to right is given in Table Q2(c). The river has a slope of 1 : 1200. Adopt Manning's coefficient as 0.03.

Point	A	B	C	D	E	F	G	H	I	J
Distance	0	18	15	18	15	18	20	18	12	10
RL of Bed	92.65	91.86	89.78	88.45	87.50	87.80	88.25	89.45	91.86	93.25

Table Q2(c)

(08 Marks)

### Module-2

3 Design a RC solid slab culvert for a two lane road with footpath with following details :

Effective span = 4.8m, carriage way = 7.5m, Footpath = 1.0m wide on either side, wearing coat = 80mm , Live load = one lane of class – AA tracked vehicle. Adopt m20 and Fe 415 grade materials. Sketch the reinforcement details.

(20 Marks)

OR

- 4 a. What is a skew slab? Explain the design consideration for a skew slab. (10 Marks)  
 b. Sketch the typical reinforcement details showing the reinforcement at top and bottom of the deck slab. (10 Marks)

**Module-3**

- 5 The super structure of a T-beam slab bridge is to be designed for the following data :  
 Effect span = 18m, clear width = 7.5m, main girder = 3 Nos spaced at 2.5m c/c, width of T-beam = 300mm, width of cross beam = 200mm, Cross beams – spaced at 3m c/c, deck slab thickness = 220mm, thickness of wearing coat = 80mm, Kerb = 550mm × 300mm. M25 concrete and Fe 415 steel. Design an interior panel of the deck slab for class-AA tracked vehicle. (20 Marks)

OR

- 6 Design the intermediate main girder for a two lane bridge for the data given in Q.5. (20 Marks)

**Module-4**

- 7 Design a RC box culvert for an opening of 3.5m and Vent height of 3.5m. Imposed dead load is  $15\text{kN/m}^2$ , imposed track load is  $15\text{kN/m}^2$ , imposed track load is  $50\text{kN/m}^2$ , soil density is  $18\text{kN/m}^3$  angle of friction =  $30^\circ$ . Use M20 concrete and Fe 415 girder steel. Sketch the reinforcement details. (20 Marks)

OR

- 8 Design a pipe culvert through a road embankment. The formation width is 12m. The side slope of embankment is 1.5 : 1, RL of stream bed level is 94.500, RL of embankment top level is 97.500. The maximum discharge is  $4.8\text{m}^3/\text{sec}$ . Take operating head of 0.4m and consider sharp edge entry. Consider two lane of class A vehicle. Given  $C_e = 2.0$  and  $C_s = 0.02$  and unit weight of soil  $18\text{kN/m}^3$ . (20 Marks)

**Module-5**

- 9 a. Sketch typical types of piers used in bridges and explain. (12 Marks)  
 b. Write a note on stability of Abutments. (08 Marks)

OR

- 10 a. What are the functions of an expansion joints? Explain any two types with sketches. (10 Marks)  
 b. Explain different types of bearings used in bridges with neat sketches. (10 Marks)

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