

# CBCS SCHEME

USN

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

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 :
  - i) Highest flood level
  - ii) Catchment area
  - iii) Design discharge
  - iv) Afflux
  - v) 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. (15 Marks)

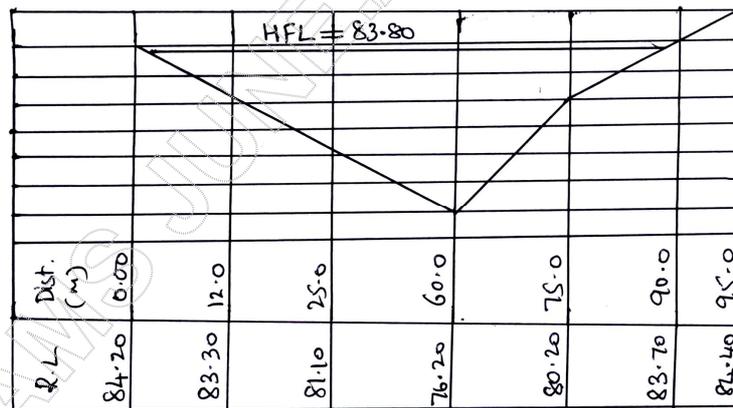


Fig. Q1(b)

(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. (08 Marks)

|           |       |       |       |       |       |       |       |       |       |       |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 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)

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 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)

\* \* \* \* \*