Exam.Code:0949
Sub. Code: 7126

1078

B.E. (Civil Engineering) Seventh Semester
Elective – I
CIV-704: Bridge Engineering

Time allowed: 3 Hours Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Section. Assume missing data suitable if any. . Use of Piguard's curves is allowed.

x-x-x

I. (a) Write the major components of a concrete bridge.
(b) Why is design discharge important for bridge design?
(c) What is the condition for the most economical span of a bridge?
(d) What type of loads are taken into account for impact effect on road bridges? Write the expression for impact factor for IRC Class A loading.
(e) Why are cross-beams provided in T-beam bridge?
(f) What are the factors affecting selection of type of prestressing, i.e.. pre-tensioning or post-tensioning?
(g) What is the main advantage of using framed piers over non-framed piers?
(h) What is the function of bearings in bridges?
(i) What is expansion bearing? Give its various types.
(j) List the four classes of quality assurances in maintenance of bridges.

Section-A (Attempt any two questions)

II. A T-beam bridge (Figure-1) has to be provided across a channel with the following data.

• Flood discharge: 30 m^3/s	• Road: National highway (2-lane)
• Bed width: 12 m	• Footpath: 1 m wide on either side
• Side slope: 1:1	• Loading: IRC Class AA
• Bed level: 50 m	• Materials: M40 concrete Fe415 steel
• HFL: 51.25 m	• No. of longitudinal girders: 3
• Maximum allowable afflux: 1.5 cm	

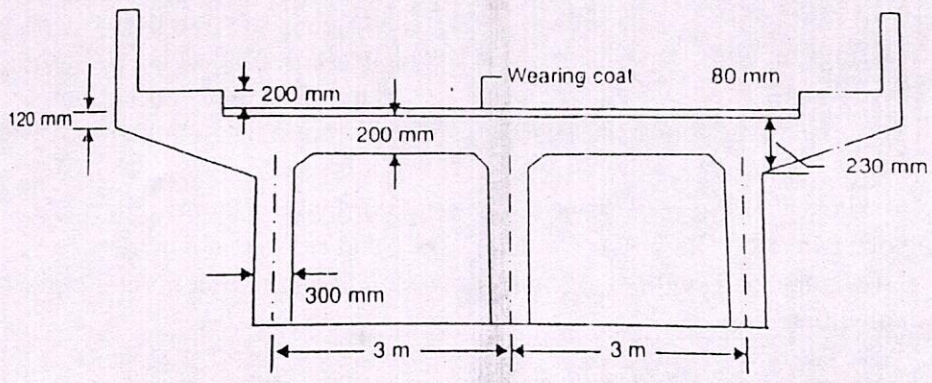

Figure-1

(a) Design the linear waterway, and (b) For the cantilever slab portion (Figure-2), of the bridge given in Ques. II above, calculate the design moment and design shear only.

[4+6=10]

P.T.O.

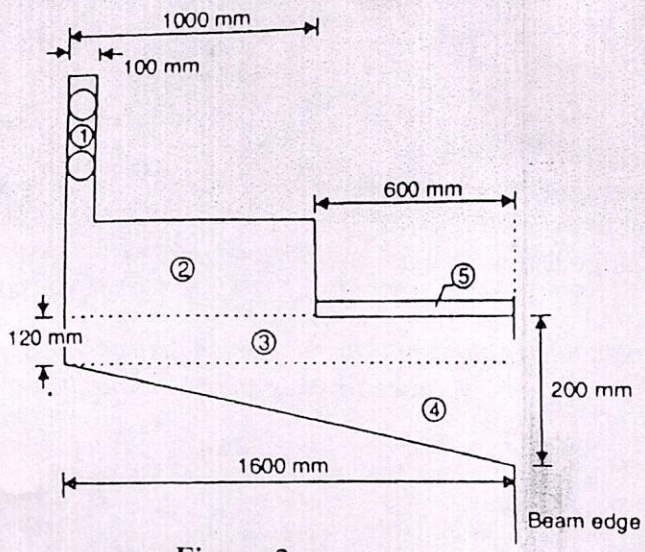

Figure-2

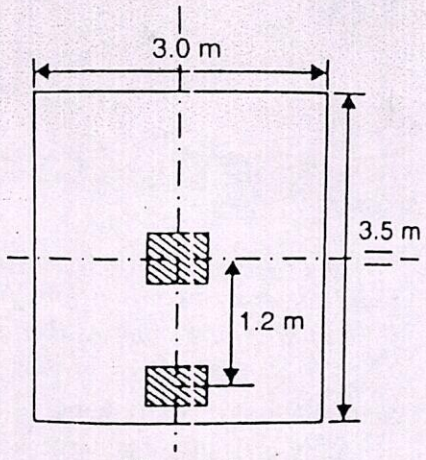

Figure-3

III. For the longitudinal girder of T-beam bridge in Figure-1, calculate the design moment for IRC Class AA loading. **[10]**

IV. Obtain the values of short-span and long-span bending moments in case of an interior panel of a T-beam road bridge (Figure-3) with the following details. **[10]**

- Dimensions of the panel: 3 m × 3.5 m
- Loading: IRC Class A
- Loading pattern: One wheel (57 kN) at the centre of the panel

Section-B (Attempt any two questions)

V. Design an elastomeric unreinforced neoprene pad bearing to suite the following data. **[10]**

- Vertical load (sustained): 200 kN
- Vertical load (dynamic): 40 kN
- Horizontal force: 60 kN
- Modulus of rigidity of elastomer: 1 N/mm^2
- Coefficient of friction: 0.3

VI. Verify the adequacy of the dimensions of the pier shown in Figure-4. The following details are available. **[10]**

- Top width of the pier: 1.6 m
- Height of the pier upto the springing level: 10 m
- C/C of bearings on either side: 1 m
- Side batter: 1 in 12
- High flood level: 1 m below the bearing level
- Span of the bridge: 16 m
- Loading on span: IRC Class AA
- Road: Two-lane road with 1 m wide footpath on either side
- Superstructure: Consists of three longitudinal girders of 1.4 m depth with a deck slab 200 mm depth
- Rib width of girders: 300 mm
- Material of pier: M15 concrete
- Maximum mean velocity of water current: 3 m/s
- Pier length: 9.5 m
- Dead load from superstructure: 1480 kN
- Unit weight of concrete in pier: 24 kN/m^3.

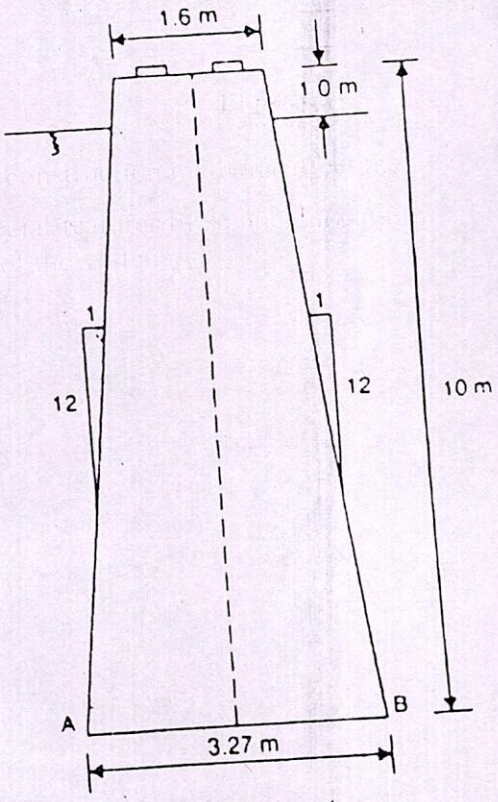

Figure-4

VII. (a) Discuss how the construction methods affect the total cost of a bridge. **[5]**

(b) What are the special features of segmental cantilever system of construction? Highlight the advantages of the system. **[5]**

X---X---X