

Total No. of Questions : 8]

SEAT No. :

P719

[Total No. of Pages : 3

[4659] - 4

**B.E. (CIVIL) (Semester - I)**

**A : STRUCTURAL DESIGN OF BRIDGES**

**(2008 Pattern) (Elective - I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates :-*

- 1) *From Section - I answer Q.1 or Q.2; Q.3 or Q.4 and from Section - II answer Q.5 or Q.6; Q.7 or Q.8.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Figures in bold to the right indicate full marks.*
- 4) *IS 456, IS 800, IS 1343 and Steel table are allowed in the examination.*
- 5) *Neat diagrams should be drawn wherever necessary.*
- 6) *If necessary, assume suitable data and indicate clearly.*
- 7) *Use of electronic pocket calculator is allowed.*

**SECTION - I**

- Q1)** a) Explain the various live loads specified for highway bridges situated on national highways. **[10]**
- b) Explain the effect of longitudinal forces and centrifugal forces on a highway bridge. **[10]**
- c) What are bridge bearings? **[5]**

**OR**

- Q2)** a) Explain Courbon's method adopted in the analysis of girders. **[10]**
- b) Derive the expression for economic span of a bridge. **[10]**
- c) Explain the classification of bearings. **[5]**

**P.T.O.**

**Q3)** Design the cantilever slab and an interior panel of the deck slab of a R.C. T - Beam deck slab bridge with the given details and also sketch the details of reinforcement. **[25]**

- a) Carriage way = 2 lanes.
- b) Footpath on either sides = 1.5 m.
- c) Thickness of railings - 90 mm.
- d) Thickness of footpath - 150 mm.
- e) Thickness of wearing coat - 80 mm.
- f) Span of main girder - 24.0 m.
- g) Spacing of cross - beams - 3.0 m c/c
- h) Live load - IRC Class AA Tracked Vehicle.
- i) Materials - M 40 grade of concrete and Fe 415 grade of steel.
- j) Adopt  $m_1 = 0.06$  and  $m_2 = 0.04$ .

**OR**

**Q4)** For the R.C. T - Beam deck slab bridge given in Q.3, design the intermediate post - tensioned girder along with the end block. Use M 50 grade of concrete and high tension strands of 7 ply 15.2 mm diameter having an ultimate tensile strength of 1800 N/mm<sup>2</sup>. Use Fe 415 steel for supplementary reinforcement. Consider loss ratio as 0.80. Sketch the cable profile. **[25]**

### **SECTION - II**

- Q5)** a) Enlist the advantages of steel bridges. **[10]**
- b) Explain with neat sketches through type, semi-through type and deck type steel bridges. **[15]**

**OR**

- Q6)** a) Design a rocker and roller bearing for the given data and also sketch the details. **[18]**
- i) Reaction from the girder = 1750 kN.
  - ii) Allowable pressure on bearings = 5 N / mm<sup>2</sup>.
  - iii) Allowable pressure on bearing plate = 2000 N / mm<sup>2</sup>.
  - iv) Allowable pressure on concrete bed = 7 N / mm<sup>2</sup>.
- b) Explain elastomeric pad bearings. **[7]**

**Q7)** Design the members  $U_1 - U_2$ ,  $U_2 - U_3$  and  $U_2 - L_2$  for the railway steel truss bridge shown in Fig. 1. Also draw a neat sketch of the connection of members at  $U_2$  [25]

- Weight of stock rail - 0.65 kN/m.
- Weight of check rail - 0.35 kN/m.
- Timber sleepers of size -  $(0.25 \times 0.25 \times 2.5)$  m @ 0.45 m c/c.
- Unit weight of timber - 7.1 kN/m<sup>3</sup>.
- Spacing of truss - 7.0 m c/c
- The bridge supports a eudl of 2950 kN.

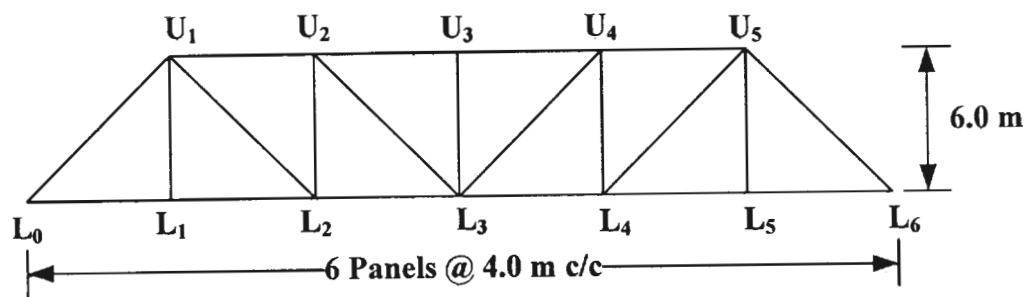


Fig. 1

OR

- Q8)** a) Explain with neat sketches the functions of bracings in steel bridges. [15]  
 b) What are mechanical bearings? Explain in brief. [10]

