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^2. 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^2.

iii) Allowable pressure on bearing plate = 2000 N / mm^2.

iv) Allowable pressure on concrete bed = 7 N / mm^2.

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]**

a) Weight of stock rail - 0.65 kN/m.

b) Weight of check rail - 0.35 kN/m.

c) Timber sleepers of size - (0.25 × 0.25 × 2.5) m @ 0.45 m c/c.

d) Unit weight of timber - 7.1 kN/m^3.

e) Spacing of truss - 7.0 m c/c

f) The bridge supports a eudl of 2950 kN.

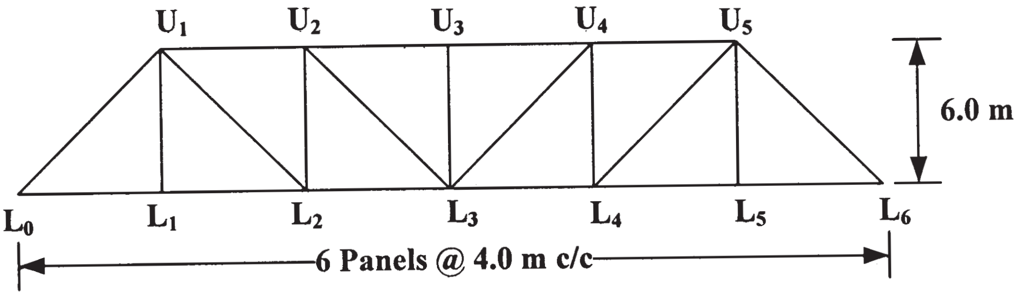

Fig. 1

OR

Q8) a) Explain with neat sketches the functions of bracings in steel bridges. **[15]**

b) What are mechanical bearings? Explain in brief. **[10]**

ⓘⓘⓘⓘ