Total No. of Questions : 10]

SEAT No. :

P1507

[Total No. of Pages : 3

[4759]-4
B.E. (Civil)
STRUCTURAL DESIGN OF BRIDGES
(2008 Course) (Semester-I) (Elective-I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer Q. 1 or Q. 2, Q. 3 or Q. 4 from section-I.***
2) ***Answer Q. 5 or Q. 6, Q. 7 or Q. 8, Q. 9 or Q. 10 from section-II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***I.S. 456, I.S. 800, I.S. 1343, IRC-21, IRC 83 and steel tables are allowed.***
5) ***Assume suitable data wherever necessary.***
6) ***Use of non programmable calculator is allowed.***

SECTION-I

Q1) a) Explain the loads considered in the design of highway bridges. **[9]**

b) Classify bridges on the basis of material of construction and forms of superstructure. **[8]**

c) Explain Pigeaud's method for the analysis of slabs. **[8]**

OR

Q2) Explain Courbon's theory for determining the load carried by

a) Longitudinal girders. **[9]**

b) Classify I.R.C loadings, explain IRC class AA tracked and wheel loading with neat sketches. **[8]**

c) Explain various types of bearings used in R.C.C bridges. **[8]**

Q3) Design an Interior pannel of R.C.C. T-beam deck slab bridge for two lane highway with following data. **[25]**

a) Clear width of Roadway = 7.5m

b) Span of the bridge = 30m

c) Footpath on either side = 1.2m

d) Spacing of longitudinal girders = 3.3m c/c

e) Average thickness of wearing coat = 80 mm

P.T.O.

f) Spacing of cross girders = 3.0m c/c

g) Live load as per IRC class AA tracked vehicle

h) Material - M 30 and Fe 500

i) Adopt $M_1 = 0.055$ and $M_2 = 0.021$

OR

Q4) For the R.C. T-beam deck slab bridge given in Que. (3), design the intermediate post tensioned prestressed girder. Use M 45 grade of concrete and high tension strands of 7 ply 15.2 mm diameter having an ultimate tensile strength of 1600 N/mm^2 use Fe 415 steel for supplementry reinforcement. Consider loss ratio 0.85, sketch the cable profile for the girder. **[25]**

SECTION-II

Q5) a) Classify railway steel bridges according to load carrying capacity and floor location with their sketches. **[8]**

b) Explain in brief equivalent uniformly distributed load. **[5]**

c) Describe Hudson's formula. **[3]**

OR

Q6) a) Explain in brief, the various types of forces acting on the railway steel bridges. **[8]**

b) Explain in brief, dynamic effect and impact for the design of railway truss steel bridges. **[5]**

c) Explain different components of plate girder steel bridge with neat sketch. **[3]**

Q7) Design an elastomeric pad bearing for a T-beam deck slab bridge on a national highway with following data. **[18]**

a) Reaction on bearing - live load of 700 kN and dead load of 300 kN.

b) Longitudinal frictional force on bearing - 45 kN.

c) Effective span of girder = 21m.

d) Estimated rotation at bearing = 0.0025 radians.

e) Estimated shear strain = 5×10^{-4}.

f) Grade of concrete for T-beam and bed block = M 30.

OR

Q8) The pratt truss through type railway bridge shown in fig (1) has the following details. **[18]**

a) Weight of stock rail = 0.60 kN/m

b) Weight of check rail = 0.40 kN/m

c) Timber steeper of six - 0.25m × 0.25m × 2.5m @ 0.45 m c/c

d) Unit weight of timber = 7.5 kN/m^3

e) Spacing of truss = 6.0m c/c

f) The bridge support a EUDL = 2950 kN

Design the member U_3U_4 and U_3L_4

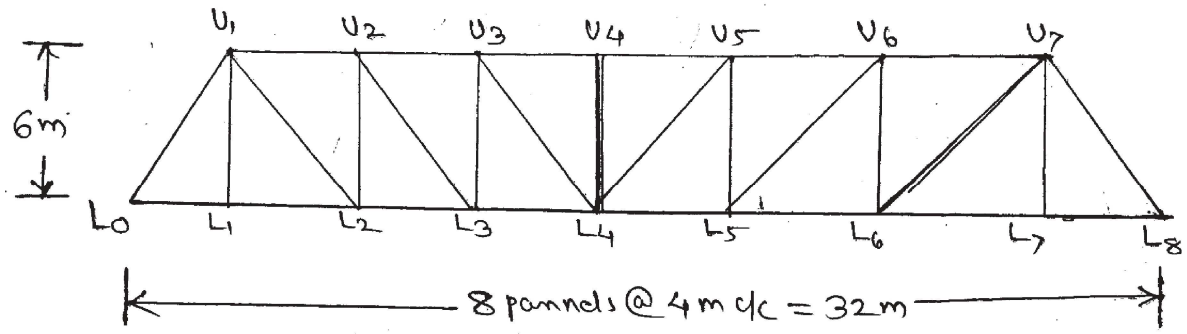

fig 1) Que. 8.

Q9) For the Pratl truss through type railway bridge given in Que (8) design the top and bottom lateral bracing with the given data. The rails are 800mm above the C.G. of bottom chord. The chord members are 500 mm deep and 500 mm wide. The end post are 500 mm deep and 500 mm wide. The web members are 500 mm deep and 240 mm wide. **[16]**

OR

Q10) Design a Rocker bearing for 32m span truss girder railway bridge with following data.

The reaction due to D.L, L.L, and I.L is 1700 kN. The verticle reaction due to over turning effect of wind at each end of the girder is 140 kN. The lateral load due to wind effect at each bearing is 70 kN. The tractive force and breaking force are 981 kN and 686 kN respectively. **[16]**

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