Total No. of Questions : 10]

SEAT No. :

P2952

[Total No. of Pages : 3

[5154]-504
B.E. (Civil)
STRUCTURAL DESIGN OF BRIDGES
(2012 Pattern) (Elective - I) (Semester - I)

Time : 2 ½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q,2; Q.3 or Q.4; Q.5 or Q.6; Q.7 or Q.8; and Q.9 or Q.10.***
2) ***Figures in bold to the right, indicate full marks.***
3) ***IRC: 6, IRC: 112, IS 456, IS 800, IS 1343 and Steel table are allowed in the examination.***
4) ***Neat diagrams should be drawn wherever necessary.***
5) ***If necessary, assume suitable data and indicate clearly.***
6) ***Use of electronic pocket calculator is allowed.***

Q1) Write a note on IRC loading with neat sketches. **[10]**

OR

Q2) What is dynamic effect in railway steel bridges? Explain how it is calculated.**[10]**

Q3) Write a note on Pigeaud's method. **[10]**

OR

Q4) An interior panel of a T beam deck slab bridge is 4.0m×2.5m. Calculate the maximum bending moment developed due to placing of IRC class A loading. **[10]**

Q5) Design the member (U-3, U-4), (U-3,L-3) for the broad gauge railway steel truss bridge shown in Fig.1. The details are as follows. **[18]**

a) Weight of stock rail = 0.60 kN/m,

b) Weight of check rail = 0.45 kN/m.

c) Timber sleepers of size = (0.25×0.25×2.5)m@ 0.40 m c/c.

d) Unit weight of timber = 6.0 kN/m^3.

P.T.O.

e) Spacing of truss = 4.5 m c/c.

f) Equivalent uniformly distributed load for BM and SF are 5831 kN and 6254 kN respectively.

g) CDA = 0.255.

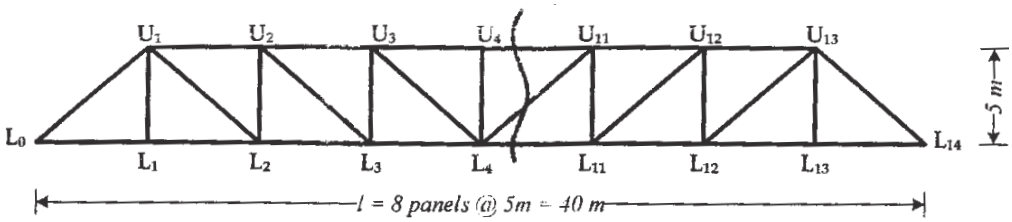

Fig. 1

OR

Q6) For the Problem given in Q.5 design the members (L-3,&L-4) and (L0-U1). **[18]**

Q7) Design a Elastomeric bearing for the following data: **[16]**

a) Maximum Normal Load = 1100 kN.

b) Minimum Normal Load -400 kN.

c) Lateral Load = 45 kN.

d) Longitudinal Load = 85 kN.

e) Total Longitudinal Translation = 10 mm.

f) Rotation at support = 0.001.

g) Shear modulus of elastomer -1.2 N/mm^2.

h) Allowable Compressive stress of Concrete = 8 N/mm^2.

i) Allowable Compressive stress of elastomer = 9 N/mm^2.

Also sketch the details of the bearing.

OR

Q8) a) The vertical reaction at the end of a bridge girder is 1500 kN. The vertical reaction at each end of the girder due to overturning effect is 60 kN. Design a roller bearing if the least allowable perpendicular distance between the faces of adjacent roller after the revolved position may be taken as 4 mm. The centers of the rollers travel 20 mm. **[10]**

b) Explain the design procedure of Rocker and Roller bearing. **[6]**

Q9) a) Explain step-by-step procedure for design of an abutment. **[8]**

b) Explain the analysis of abutments and piers. **[8]**

OR

Q10) Design a RC abutment for a RC T-beam deck slab bridge with the following data. **[16]**

a) Span = 30 m.

b) Width of carriageway = 7.5 m.

c) Live load on the deck slab = IRC Class AA.

d) Dead weight of span = 8800 kN.

e) Longitudinal force = 220 kN.

f) RL of formation = 640.150 m; RL of cg of girder = 638.100 m; RL of center of bearing pin = 637.000 m; RL of bed level = 629.800 m.

g) Unit weight of backfill soil = 16 kN/m^3.

h) Allowable bearing pressure = 220 kN/m^2.

i) μ = 0.32, $\Phi = 30^o$, Ground acceleration = 0.11 g,

j) Materials = M 30 grade concrete and steel of grade Fe 500.

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