Total No. of Questions : 10]

SEAT No. :

P2145

[Total No. of Pages : 3

[5059]-504
B.E. (Civil)
STRUCTURAL DESIGN OF BRIDGES
(2012 Pattern) (Elective-I) (Semester-I) (401004A)

Time : 2½ 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) Give the classification of bridges according to material of construction and forms of super structure. **[10]**

OR

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

Q3) Write a note on Courbons method. **[10]**

OR

Q4) An interior panel of a T beam deck slab bridge is 4.0m × 3.5m. 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 = 0.50 kN/m,

b) Weight of check rail = 0.40 kN/m

c) Timber sleepers of size = (0.25 × 0.25 × 2.8) m@ 0.45 m c/c

P.T.O.

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

e) Spacing of truss = 5.0 m c/c

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

g) CDA = 0.255

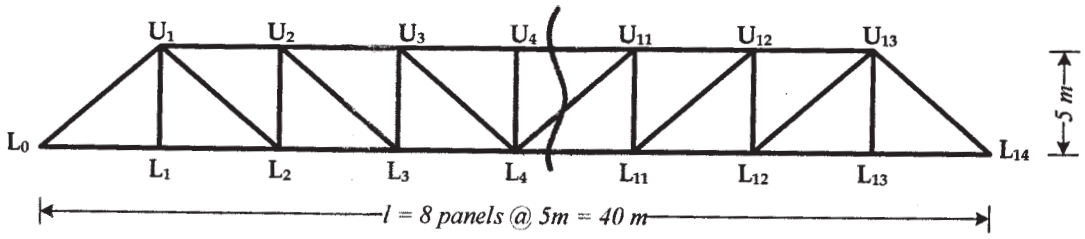

Fig. 1

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 = 1200 kN

b) Minimum Normal Load = 350 KN

c) Lateral Load = 50 kN

d) Longitudinal Load = 80 KN

e) Total Longitudinal Translation = 10mm

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 2000 kN. The vertical reaction at each end of the girder due to overturning effect is 100 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 4mm. The centers of the rollers travel 20mm. **[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 = 40m

b) Width of carriageway = 7.5m

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

d) Dead weight of span = 10000 kN

e) Longitudinal force = 250 kN

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

g) Unit weight of backfill soil = 18 kN/m^3

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

i) $\mu = 0.32$, $\Phi = 30°$, Ground acceleration = 0.11 g

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

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