

Total No. of Questions : 10]

SEAT No. :

P2042

[4859] - 1004

[Total No. of Pages : 3

B.E. (Civil)

STRUCTURAL DESIGN OF BRIDGES

(2012 Pattern) (Elective- I)

Time : 2½Hours]

[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) What are IRC loading standards? Explain any one loading case. **[10]**

OR

Q2) Explain loading standards for railway bridges. **[10]**

Q3) What are Pigeaud's curves? Explain in brief. **[10]**

OR

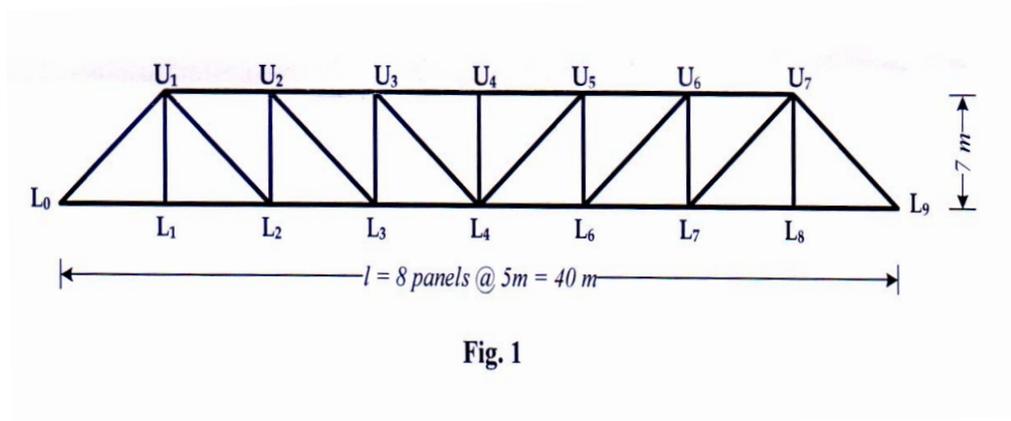
Q4) Show the placing of wheel loads for obtaining maximum bending moment and shear force on an interior panel of a T-beam deck slab bridge for IRC Class 70R and Class A loading. **[10]**

Q5) Design the members U_2-U_3 , U_2-L_2 for the broad gauge railway steel truss bridge shown in fig.1. The details are as follows. **[18]**

- a) Weight of stock rail =0.65kN/m,
- b) Weight of check rail =0.5kN/m
- c) Timber sleepers of size =(0.25×0.25×2.5) m@0.45m c/c
- d) Unit weight of timber =6.2kN/m³
- e) Spacing of truss = 6.0 m c/c

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- f) Equivalent uniformly distributed load for BM and SF are 3498kN and 3815kN respectively.
- g) CDA = 0.324



OR

Q6) For the problem given in Q.5 design the members L_2-L_3 and L_3-U_2 . **[18]**

Q7) Design an elastomeric bearing for the given data and also sketch the details. **[16]**

- a) Maximum normal load = 1250 kN.
- b) Minimum normal load = 400kN
- c) Lateral load = 35kN
- d) Longitudinal load = 85 kN
- e) Total longitudinal translation = 10mm
- f) Rotation at support = 0.001
- g) Shear modulus of elastomer = 1.0 N/mm²
- h) Allowable compressive stress for concrete = 8N/mm²
- i) Allowable compressive stress for elastomer = 9N/mm²

OR

- Q8)** a) What are bearings? Explain the classification of various types of bearings with neat sketches. **[8]**
- b) Explain the design procedure for rocker bearing. **[8]**

- Q9)** a) Explain with neat sketches the different types of piers used for reinforced concrete and steel bridges. [8]
- b) Explain the loads considered in the design of piers and abutments. [8]

OR

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

- a) Span = 15m
- b) Width of carriageway = 7.5m
- c) Footpath = 1.5 m on either sides
- d) Live load on the deck slab = IRC Class A
- e) Dead weight of span = 4000 kN
- f) Longitudinal force = 200 kN
- g) Load on footpath = 5kN/m²
- h) RL of formation = 500.000 m; RL of cg of girder = 499.100 m; RL of center of bearing pin = 498.000 m; RL of bed level = 490.000 m.
- i) Unit weight of backfill soil = 18kN/m³
- j) Allowable bearing pressure = 250 kN/m²
- k) $\mu=0.35$, $\Phi=35^\circ$, Ground acceleration = 0.1g.
- l) Materials = M 30 grade concrete and steel of grade Fe500

