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Total No. of Questions : 09

B.Tech.(Civil Engg.) (2011 Onwards) (Sem.–7/8)

DESIGN OF STEEL STRUCTURES - II

Subject Code : BTCE-801

Paper ID : [A2956]

Time : 3 Hrs.   Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**
4. **Use of IS 800 : 2007 & Steel table is permitted.**
5. **Assume any missing data.**

SECTION–A

1. **Write briefly:**

   a) Why end bearing stiffeners are provided?

   b) What are various locations where foot bridges are used?

   c) Discuss the role of stringer in steel structures?

   d) List the connections that can be used for resisting moment.

   e) What is a foot bridge? What is the popular geometry of the foot bridge?

   f) Discuss the role of portal sway bracing in Railway Bridge.

   g) State the advantages of north light trusses over other forms of trusses.

h) A bracket is connected to the flange of a column by complete penetration butt weld. How you will calculate equivalent stress?

i) Explain moment of inertia method for checking the section of plate Girder Bridge.

j) Write short note on wheel loads equivalent uniformly distributed loading for Indian Railway Bridges.

SECTION–B

2. Design a suitable bearing for a plate girder railway bridge of span 3.2m centre to centre of bearings. The bridge is designed for meter gauge single track main line.

3. Explain the following with neat sketches :

a) Bracing system in roof trusses

b) Anchorage of truss with concrete column

c) Connection of purling to rafter.

4. A plate girder section is made up of a web of 270 cm × 1.5 cm, arid flange angles 150 mm × 150 mm × 12 mm and one cover plate in each flange of 45 cm × 1.5 cm. The girder is supported at either end on bearing plates 500 mm × 500 mm. If the maximum end reaction is 1820 kN, design the end stiffener using a cluster of 4 angles 150 mm × 150 mm × 15 mm. Assume F_y = 250 MPa.

5. Design a suitable bearing for a foot bridge having clear road way of 7.5 m and effective span of 18m.

6. Draw neat sketch and explain the design principle for Unstiffened seat connections for transfer of shear.

SECTION–C

7. A pratt truss girder through bridge is provided for single broad gauge track. The effective span of the bridge is 40 m. The cross girders are provided at 4.2 m apart. The stringers are spaced 2 m between centre lines. If 0.60 kN/m stock rails and 0.40 kN/m-check rails are provided. Sleepers are spaced at 0.40 m from center to center and are of size 3 m × 250 mm × 250 mm. Weight of timber may be assumed as 7.5 kN/m^3. The main girder is provided at spacing of 7.5 m between the center lines. Design the central top chord and bottom chord member and vertical and diagonal of central panel. The bridge is to carry standard main line loading.

8. Design a gantry girder to carry an electric overhead travelling crane for the following data :

Crane Capacity = 260 kN

Self weight of crane alone = 200 kN

Self weight of trolley, electric motor, hook etc = 70 kN

Minimum approach of crane hook = 1.2 m

Distance between centers of crane wheels = 3.5 m

Distance between cranes of gantry girders = 14 m

Span of gantry girder = 8 m

Weight of rail section = 0.300 kN/m.

9. a) Explain the design procedure of eccentric riveted connection for a case when line of action of load does not lie in the plane of group of rivets, and the line of rotation does not pass through the centre of gravity of group of rivets.

b) **Fig 1**. shows a portal bracing in a through truss girder bridge subjected to a lateral force of 150 kN. Determine the forces in various members of the portal bracing.
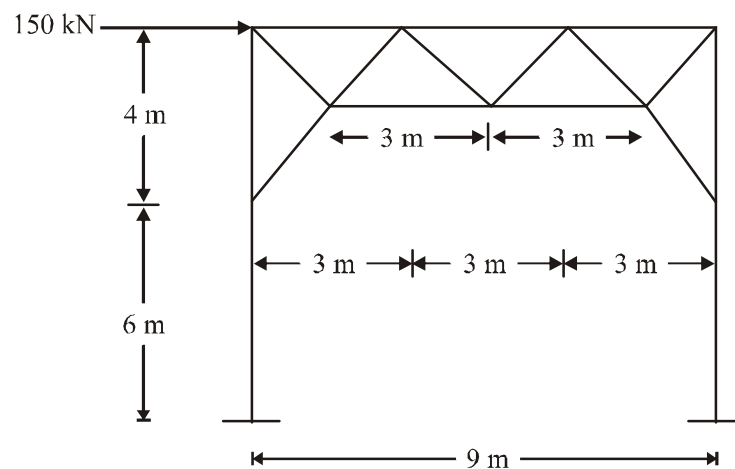

Fig. 1