1019

Code : 15CE61T

Register Number

DESIGN OF STEEL & MASONRY STRUCTURES

Time : 3 Hours]   [Max. Marks : 100

Instructions : (i) Answer any **five** questions from PART – A and any **five** questions from Part–**B**.

(ii) Use of IS 800-2007 and steel table is permitted.

(iii) Missing data may be assumed.

PART – A

1. What are the advantages of structural steel ?   5

2. Why wide flange beam sections are preferred over narrow ISMB beams ?   5

3. Write a note on High strength friction grip bolts.   5

4. Explain how low shear and high shear affect design bending strength of a beam. 5

5. Explain : (i) Web buckling (ii) Wed crippling   5

6. Write a note on block shear failure of tie members.   5

7. Write a note on Gusset base.   5

8. What are the advantages of welded joint over bolted joint ?   5

PART – B

9. (a) Differentiate between Black bolts and turned bolts.   5

(b) Design a lap joint between two plates of size 100×16 mm and 100×10 mm so as to transmit a factored load of 100 kN. Use a single row of M16 bolts of grade 4.6 and grade 410 plates.   10

Also find efficiency of the joint.

[Turn over

10. (a) Design a Lap welded connection to join plates of size 150 × 10 mm and 100 × 10 mm to mobilize full design strength of smaller plate. Assume fy = 250 mpa and E41 electrodes. **6**

   (b) A tie member of a truss consists of an angle section. **9**

   ISA 65 × 65 × 6 of Fe410 grade is welded to an 8 mm gusset plate. Design side welds to transmit a load equal to full design strength of the member.

   Assume shop welds of E41 grade electrodes.

11. An ISLB 600 @ 976.1 N/m has been used as a simply supported beam over an effective span of 7.2 m. Determine the safe total uniform load, the beam can carry over its entire span. Assume that beam is laterally supported.

   Take E = 200 GPa

   Ultimate stress = 410 MPa

   Also check for deflection. **15**

12. A single unequal angle ISA 100 × 75 × 6 is connected to a 10 mm thick gusset plate through its longer leg at the ends with six members of 16 mm diameter bolts with a pitch of 40 mm and an edge distance of 30 mm. The guage "g" of bolts is 60 mm from back of the angle. Determine design tensile strength of the angle. Assume Fe410 steel. **15**

13. (a) Design a column 4 m long subjected to a factored load of 1000 kN. Both ends of the column are effectively restrained in direction and position use steel of grade Fe410. **8**

   (b) Calculate the design strength of a discontinuous strut of length 3.0 m. The strut consists of two unequal angles 100 × 75 × 8 mm with long legs connected and placed on the opposite sides of 10 mm thick gusset plate. Take f_g = 250 Mpa.

   Assume that end connection consists of three bolts of 20 mm diameter & angles are tack bolted. **7**

14. Design a slab base for a column ISHB 350 @ 710.2 N/m subjected to a factored axial compressive load of 1500 kN. The column end and base plate have not been machined for perfect bearing. Also design welded connection.

   Take characteristic strength of concrete of pedestal as 20 MPa. **15**

15. A trapezoidal masonry retaining wall is 8 m high, 1 m wide at top and 3 m wide at bottom with a vertical face retaining earth, level with the top of the wall.

   Calculate the pressure intensities at the base and draw pressure intensity diagram. Take density of masonry as 24 kN/m³, density of earth as 16 KN/m³ and angle of repose as 40°. **15**

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