Code: 15A01602

R15

B.Tech III Year II Semester (R15) Supplementary Examinations December/January 2018/19

DESIGN & DRAWING OF STEEL STRUCTURES

(Civil Engineering)

Time: 3 hours Max Marks: 70

Use of IS 800:2007, IS: 875 (Part III)-1987, structural steel tables are to be permitted in the examination hall

PART – A

(Answer any one question, 1 × 28 marks)

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1 A mild steel plate girder simply supported at two ends has an effective span of 16 m. Design the central section of the plate girder providing at least two flange plates on each side. Curtail one of the plates wherever necessary. Dead load = 40 kN/m, Imposed load = 45 kN/m. Allow for impact. Determine the actual length of outermost plate, connection between flange angle and web plate, connection between flange angle and flange plate. Also design bearing stiffener and intermediate stiffeners if required. Use 20 mm ϕ common bolts for connections. Assume thickness of web plate = 12 mm. Sketch longitudinal sectional elevation, cross section at mid-span and sectional plan.

2 Design a simply supported crane girder for the following data. The girder is electrically operated. Take yield stress of steel as 250 N/mm^2. Use 16 mm diameter bolts of grade 4.6.

(i) capacity of the crane = 250 kN
(ii) weight of the crab(trolley) = 80 kN
(iii) Weight of the crane girder excluding trolley = 300 kN
(iv) Span of the crane girder = 18 m
(v) minimum hook approach = 1.0 m
(vi) Wheel base = 3.0 m
(vii) Span of the gantry girder = 6 m
(viii) Weight of the rail section = 0.25 kN/m

Draw plan and cross section of gantry girder.

PART – B

(Answer any three questions, 3 × 14 marks)

3 (a) Explain the phenomenon of load transfer in high strength friction grip bolts.
(b) Explain shear lag effect and block shear failure.
(c) How is strength of bolted connections calculated?

4 (a) Discuss various failure modes of compression members.
(b) Design a built-up column 9 m long to carry a factored axial compressive load of 1100 kN. The column is restrained in position but not in direction at both ends. Design the column with connecting system as battens with bolted connection. Use channels back to back and steel of grade Fe410.

5 (a) Explain web buckling and web crippling in beam.
(b) Design a purlin for a span of 4 m with spacing 2.5, wind pressure 1.5 kN/m^2 and slope of principal rafter 26.56^0.

6 (a) A column ISHB 200@ 392.4 N/m has to support a beam ISHB 300@433.6 N/m. The beam transmits a factored end reaction of 100 kN. Design an unstiffened welded seat connection. Consider seat angle 100 x 75 x 10 mm and clearance between the column flange and beam = 5 mm.
(b) Explain in design principles of eccentric connections with brackets.

7 Design a welded plate girder 24 m in span and laterally restrained throughout. It has to support a uniform load of 100 kN/m throughout the span exclusive of self-weight. Design the plate girder without intermediate transverse stiffeners. Also design the cross section, the end load bearing stiffener and connection.

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