Code: 15A01602

R15

B.Tech III Year II Semester (R15) Regular Examinations May/June 2018
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)
*****

1   A simply supported welded plate girder has an effective span of 30 m with a u.d.l of 30 kN/m and a two concentrated load of 150 kN each acting at 10 m from both ends. It is fully restrained against lateral buckling throughout the span. Design the central section using thin web with K = 100 and end bearing stiffener. Also design the welded connection between flange and web. Take f_y = 250 MPa, f_u = 415 MPa and ultimate stress of weld = 410 MPa. Also design curtailment of plate.

2   Design a gantry girder to be used in an industrial building carrying a manually operated overhead travelling crane, for the following data:
       (i) Crane capacity 200 kN.
       (ii) Self-weight of the crane girder excluding trolley 200 kN.
       (iii) Self-weight of the trolley, electric motor, hook, etc. 40 kN
       (iv) Approximate minimum approach of the crane hook to the gantry girder 1.20 m.
       (v) Wheel base 3.5 m.
       (vi) c/c distance between gantry rails 16 m.
       (vii) c/c distance between columns (span of gantry girder) 8 m.
       (viii) Self-weight of rail section 300 N/m.
       (ix) Diameter of crane wheels 150 mm.
       (x) Steel is of grade Fe410.
Design also the field welded connection if required. The support bracket connection need not be designed. Draw cross section of gantry girder.

PART – B
(Answer any three questions, 3 × 14 marks)

3   (a)   Explain various modes of failure (behavior) of bolted connections with neat sketches.
     (b)   Design a single angle tension member to carry a design tensile load of 400 kN. Gusset plate is of 8 mm thickness. Adopt 20 mm diameter black bolts for connection.

4   (a)   Design a slab base for a column ISHB 300@577 N/m carrying an axial load of 1000 kN. Adopt M20 concrete and welded connection between column and base plate.
     (b)   Discuss general requirement for battening system as per IS 800.

5   (a)   A simply supported beam of span 5 m is subjected to a superimposed load of 30 kN/m over entire span and a concentrated load of 200 kN at mid span. Design the beam and check for deflection and shear. The beam is laterally supported throughout.
     (b)   Differentiate between laterally supported beam and laterally unsupported beam with neat sketches.

6   (a)   An ISMB 300@433.6 N/m beam has to be connected to the flange of an ISHB 200@392.4 N/m column with 20 mm dia. bolt. Design unstiffened seated connection for a factored beam reaction of 120 kN. Consider seat angle 150 x 75 x 12 mm and clearance between the beam end and column = 3 mm.
     (b)   How are the building connections classified based on their moment rotation characteristics?

7   Design a hand operated travelling crane simply supported by gantry girder for the given data: Span of gantry girder = 5 m, span of crane girder = 15 m, crane capacity = 200 kN, self-weight of crane girder excluding trolley = 200 kN, self –weight of trolley = 30 kN, minimum hook approach = 1 m, distance between wheels = 3.5 m c/c, self-weight of rails = 0.3 kN/m. Checks for buckling and deflections are not required.

*****