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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Seventh Semester, B.E. - Civil Engineering

Semester End Examination; Dec - 2017/Jan - 2018

Design of Steel Structures

Time: 3 hrs *Max. Marks: 100*

***Note**: i) Answer **FIVE** full questions, selecting **ONE** full question from each unit.*
ii) IS: 800 - 2007 and steel tables are permitted.
iii) Any missing data may suitably be assumed.

UNIT - I

1 a. Explain the load transfer mechanism in HSFG bolted connection. 5

b. Find the maximum force which can be transferred through double covered bolt joint shown in Fig. Q 1(b). Find the efficiency of the joint also. Use M20 bolts of grade 4.6 and Fe410 steel plates. 15

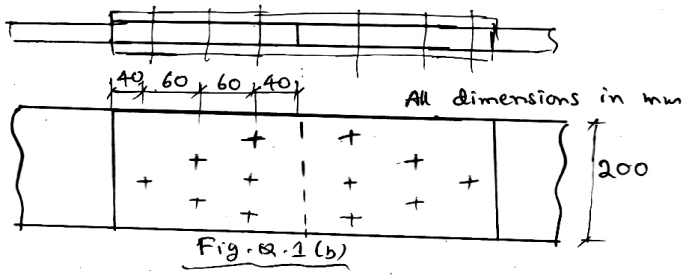

Fig. Q. 1 (b)

2 a. Explain, with the help of moment-rotation relation, classification of steel sections for flexural design. 6

b. Design a bracket connection to carry an unfactored load of 150 kN. The eccentricity of the load is 250 mm as shown in Fig. Q. 2(b). Use M20 of 4.6 grade bolts. 14

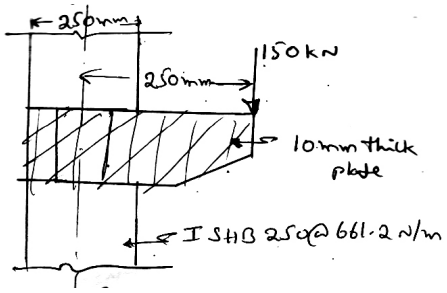

Fig. Q. 2(b)

UNIT - II

3 a. With neat sketches, explain the defects in welded connections. 8

b. Design a suitable welded joint, if the lap of the channel ISMC 300 @ 35.8 kg/m with the gusset is 350 mm. Thickness of the gusset plate is 12 mm. Design the joint for the tensile strength of the channel section. Use Fe410 steel and shop weld. 12

4 a. Write the advantage and disadvantages of welded connections over bolted connections. 10

b. A bracket plate 12 mm thick is used to transmit a factored reaction of 100 kN at an eccentricity of 150 mm from the flange of a column as shown in Fig. Q. 4(b). Design; 10

i) Groove weld ii) Shop fillet weld.

Contd…2

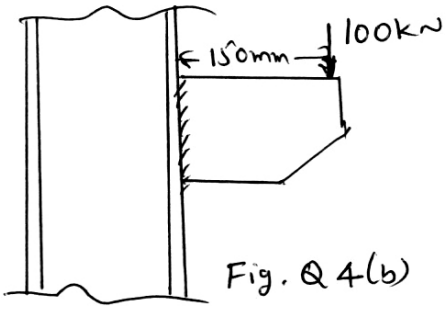

Fig. Q 4(b)

UNIT - III

5 a. Explain three modes of failure in tension members. 6

b. Compute the tensile strength of an angle section ISA 100 x 75 x 8 mm is connected to a 10 mm thick gusset plate at the ends by 5 mm shop weld. The longer leg is connected to the gusset plate. Also design proportioning of weld. 14

6 a. Write a short note on lug angles. 4

b. Design a suitable angle section to carry a factored tensile force of 210 kN, assuming a single row of M20 bolts. The length of the member is 3 m. The member is subjected to the possible reversal of stress due to the action of wind. 16

UNIT - IV

7 a. A column 6 m long is effectively held in position and restrained against rotation at both ends. If ISHB 400 and 77.4 kg/m is used, calculate the load carrying capacity of the column. Take f_y = 250 MPa. 10

b. Draw neat sketch of various types of bolted column splices. 10

8. Design a built-up column consisting of two channel sections placed back to back of length 10 m to carry an axial factored load of 1300 kN. The column may be assumed to have restrained in position but not in direction at both ends. Also design the single lacing for the system with bolted connection. 20

UNIT - V

9 a. Describe: i) Plastic neutral axis ii) Elastic and plastic section modulus iii) Shape factor and load factor iv) Plastic hinge. 10

b. Determine the position of plastic hinge from support B for the beam shown in Fig. Q. 9(b) and also find the magnitude of collapse load. 10

10 a. With neat sketches, explain the lateral stability of beams. 8

b. Calculate the moment carrying capacity of a laterally unrestrained simply supported beam of length 3 m, if the section ISLB 300 @ 37.7 kg/m is used. Also find the load carrying capacity of the section. 12

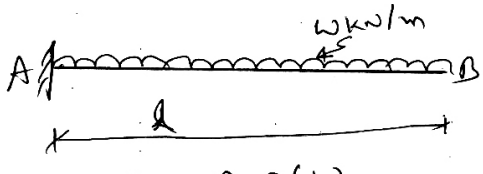

Fig. Q. 9(b)

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