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10CT72

Seventh Semester B.E. Degree Examination, Aug./Sept.2020

**Design of Structures (Steel & PSC)**

Time: 3 hrs.

Max. Marks:100

Note: 1. Answer any FIVE full questions, selecting atleast TWO questions from each part.  
2. Use of IS Codes IS800-2007, IS-875:1987, Steel tables; SP6; IS 1343 are permitted.

**PART - A**

- 1 Explain how do you classify and steel sections sand write the advantages and disadvantages of steel structures. (20 Marks)
- 2 Determine the bracket load it can carry for the shown connection. Use M20 bolts with property class 4.6. [Refer Fig. Q2] (20 Marks)

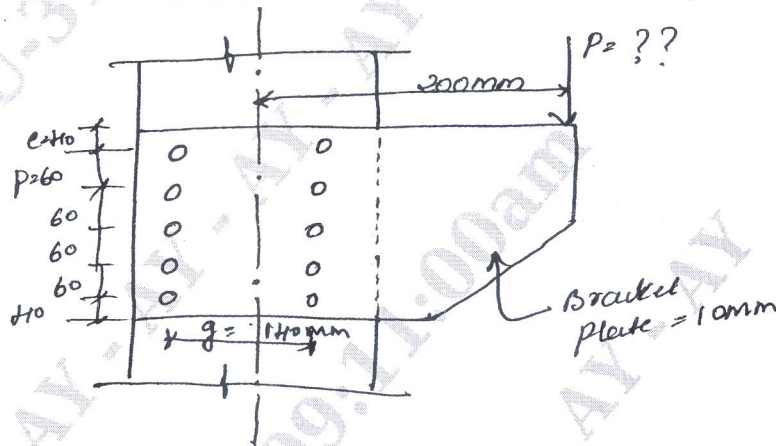


Fig. Q2

- 3 Determine the bracket load the connection can carry use 8 mm fillet weld. [Refer Fig.Q3] (20 Marks)

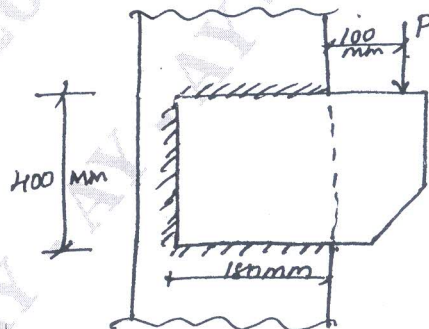


Fig. Q3

- 4 a. Design a single angle member used to carry a design tensile load of 400 kN. Gusset plate is of 8 mm thickness. Adopt 20 mm dia black bolts for connection. Design the connection as a bolted connection Assume any missing data suitably. (15 Marks)  
b. Explain the different modes of failure of compression members. (05 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

**PART – B**

- 5 a. State the advantages of pre-stressed concrete. (05 Marks)  
 b. Explain the stress – strain relationships for pre stressing tending as per IS code with neat sketches and relevant graph. (15 Marks)
- 6 An unsymmetrical I – section beam is used to support an imposed load of 2kN/m over a span of 8m. the sectional details are : Top flange 300mm wide and 60mm thick ; bottom flange 100mm wide and 60mm thick ; thickness of web = 80mm ; overall depth of the beam = 400mm. At the quarter of the span, the effective prestressing force of 100kN is located at 50mm from the soffit of the beam. Estimate the stress at the “quarter of span”. Section of the beam for the following load conditions.  
 (i) Prestress + self weight (At transfer)  
 (ii) Prestress + self weight + live load (At working) (20 Marks)
- 7 a. Explain with neat sketch the concept of load balancing. (06 Marks)  
 b. A rectangular concrete beam 100mm wide and 250mm deep spanning over 8m is prestressed by a parabolic cable with prestressing force 250kN. With zero eccentricity at support and 40mm at mid span. The beam supports a live load 1.2kN/m. Determine the position of pressure line. (14 Marks)
- 8 a. Explain the following losses in pre-stress with relevant formulae.  
 (i) Loss due to elastic deformation of concrete.  
 (ii) Loss due to shrinkage of concrete  
 (iii) Loss due to creep of concrete  
 (iv) Loss of stress due to friction. (08 Marks)  
 b. A pre tensioned concrete beam 200×300mm and span 6m is initially prestressed by a force of 400kN applied at a constant eccentricity of 70mm by tendons of area 400mm<sup>2</sup>. If  $E_s = 2 \times 10^5 \text{ N/mm}^2$   $E_c = 0.333 \times 10^5 \text{ N/mm}^2$ , creep co-efficient in concrete = 2.0, shrinkage strain in concrete = 0.0002, stress reduction in steel = 3%. Find percentage loss of stress in tendon. (12 Marks)

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