10CT72

Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020
Design of Structures (Steel and PSC)

Time: 3 hrs. Max. Marks:100

Note: 1. *Answer any FIVE full questions, selecting at least TWO questions from each part.*
  2. *Use IS codes IS – 800 : 2007, steel table or SP6 and IS1343 – 1980 permitted.*
  3. *Assume any missing data suitably*

PART – A

1 a. Explain what are the advantages and disadvantages of steel structures. **(10 Marks)**
   b. What are different loads to be considered in the design of steel structures? List the different load combinations used as per code book. **(10 Marks)**

2 a. Explain various modes of failure of bolted connections with neat sketch. **(08 Marks)**
   b. Design a bolted connection for a lap joint of plate thickness 10mm and 12mm to carry a factored load of 150kN. Use M16 of grade 4.6. Assume the bolts are fully threaded. **(12 Marks)**

3 a. What are the advantages and disadvantages of welded connections? **(06 Marks)**
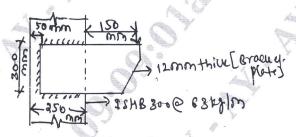   b. Calculate the factored load that can be supported by bracket connection shown in Fig Q3(b).

Fig Q3(b) **(14 Marks)**

4 a. Explain 14g angle with neat sketch. **(08 Marks)**
   b. Determine the design tensile strength if longer legs are connected to the gusset. A single unequal angle ISA 100×75×6mm is connected to 10mm thick gusset plate with 6 numbers of 16mm bolts to transfer tension. Assume pitch and edge distance of 40mm each. **(12 Marks)**

PART – B

5 a. Explain the necessity of using high strength concrete and high tensile steel in prestressed concrete structures. **(10 Marks)**
   b. Explain pretensioning and post tensioning methods of prestressing of concrete with neat sketch. **(10 Marks)**

6 a. Explain load balancing concept with examples. **(06 Marks)**
   b. A concrete beam of symmetrical I-section has an effective span of 8m. The width of beam is 400mm, depth 500mm, web thickness is 80mm. The beam is prestressed by a parabolic cable with an eccentricity of 150mm @ the centre and zero @ the supports. The effective prestress force is 180kN. The live load on the beam is 8 kN/m. Draw the stress distribution diagram @ 3m span from the left for prestress +self weight + live load. **(14 Marks)**

7 A pretensioned, T-section has a flange 1200mm wide and 150mm thick. The width and depth of the rib are 300mm and 1500mm respectively. The high tensile steel has an area of $4700mm^2$ and is located at an effective depth of 1600mm. If characteristics cube strength of the concrete and the tensile strength of steel are 40 and 1600 N/mm^2 respectively, calculate the flexural strength of the T-section.. **(20 Marks)**

8 a. List various losses of pre-stresses and explain any 4 with formula. **(10 Marks)**

   b. A pre-tensioned concrete beam, 100mm wide and 300mm deep, is pre-stressed by straight wires carrying an initial force of 150kN at an eccentricity of 500mm. The modulus of elasticity of steel and concrete are 210 and 35kN/mm^2 respectively. Estimate the percentage loss of stress in steel due to elastic deformation of concrete if the area of steel wires is $188mm^2$. **(10 Marks)**

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