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10CT72

Seventh Semester B.E. Degree Examination, June/July 2019
Design of Structure (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 of IS800-2007, Steel tables ; SP6 ; IS 1343are permitted.

PART – A

1 a. Write a note on failure criteria of steel as per IS 800. **(06 Marks)**

b. Define the terms "characteristic strength" and "Characteristic load" as applicable to steel structures. **(04 Marks)**

c. With a neat flowchart, explain the steps adopted in design of steel structures. **(10 Marks)**

2 a. Compare the different types of bolts as per the design of bolted connection. **(06 Marks)**

b. Design a bolted web cleat connection for ISMB 600 and two secondary beams ISMB 400 and ISBM 300. The ISMB300 beam carries a factored load of 250 kN and ISMB400 beam carries a factored load of 350 kN. Adopt M22 bolts and Fe410 steel. Assume any missing data suitably and mention the same while designing. **(14 Marks)**

3 A tie member of a truss consists of a double angle section, each 80 mm × 80 mm welded on the opposite side of a 12 mm thick gusset plate as shown in Fig. 3. Design a fillet weld for making the connection in the work-shop. The factored tensile force in the member is 300 kN. **(20 Marks)**

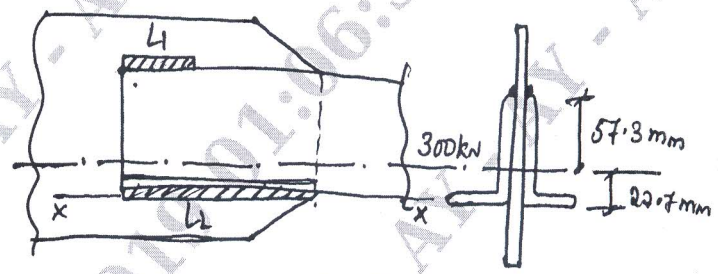

Fig.Q3

4 Compute the tensile strength of an angle section ISA 150 × 115 × 8 mm of Fe410 grade of steel connected with the gusset plate as shown in Fig. Q4 for the following cases.

i) Gross section yielding
ii) Net section rupture. **(20 Marks)**

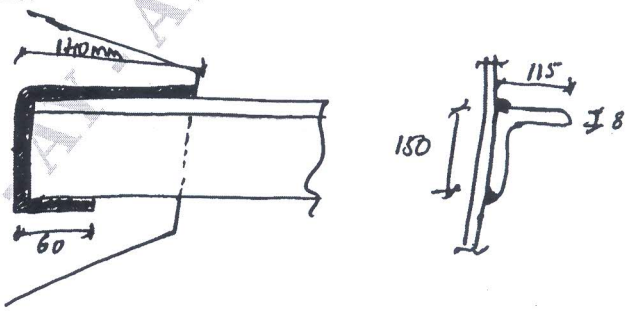

Fig.Q4

PART – B

5 a. Explain need for using high strength concrete and high strength steel in PSC structures. **(06 Marks)**

b. What are the advantages and disadvantages of P.S.C over R.C.C. **(08 Marks)**

c. With a neat sketch explain pre-tensioning system of Hoyer's long line. **(06 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. Mention and explain all the losses to be considered for both pre-tensioned and post-tensioned members. **(10 Marks)**

b. A pre-tensioned concrete beam 200 mm × 300 mm and span 6 m is initially pre-stressed by a force of 400 kN applied at a constant eccentricity of 70 mm by tendons of area 400 mm^2. If $E_S = 2 \times 10^5$ N/mm^2, $E_c = 0.333 \times 10^5$ N/mm^2, creep co-efficient in concrete = 2.0 shrinkage strain in concrete = 0.0002, stress relaxation in steel 3%. Find % age loss of steel in Tendon. **(10 Marks)**

8 a. Explain the following losses in pre-stresses with relevant formulas :

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. **(12 Marks)**

b. A rectangular concrete beam 300 × 200 mm, is pre-stressed by means of 15 – 5 mm dia wires located at 65 mm from bottom of beam and 3 – 5 mm wires located at 25 mm from top of the beam. If the wires are initially tensioned to a stress of 840 N/mm^2, calculate the % loss of steel immediately after transfer. $E_s = 210$ kN/mm^2 and $E_c = 31.5$ kN/mm^2. **(08 Marks)**

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