USN | | | | | | | | | | |

10CT72

Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019
Design of Structures (Steel and PSC)

Time: 3 hrs. Max. Marks:100

Note: ***1. Answer any FIVE full questions, selecting at least TWO full questions from each part.***
2. Use of IS800-2007; IS1383-1980 and steel tables can be allowed.

PART – A

1 a. List atleast 5 advantages and disadvantages of steel structures. **(10 Marks)**

b. Two plates of thickness 16mm and 12mm are to be connected by a groove weld of effective length 150mm. The joint is subjected to a factored tensile force of 300kN. Check the safety of the joints for i) Single V-grove weld; ii) Double V-grove weld. Assume Fe410 grade steel plate and shop weld. **(10 Marks)**

2 Find the maximum load "P" the bracket connection can carry. Use M20 bolts of property class 4.6. Assume shear in thread region. **(20 Marks)**

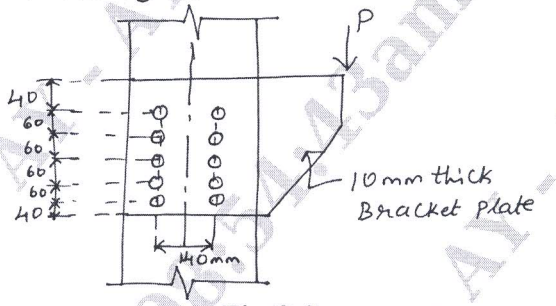

Fig.Q.2

3 a. Write a note on types of welds with neat sketch. **(06 Marks)**

b. Design a welded connection for a tension member ISA 100 × 65 × 8 connected to gusset plate with 2 sides welding. The tensile load is equal to the full strength of the member. **(14 Marks)**

4 Design a compression member using double channel section "Face to Face" to carry a factored load of 1600 kN. The length of column is 5m, with one end fixed and one end hinged. Also design single lacing system. **(20 Marks)**

PART – B

5 a. Explain with neat sketch Freyssinet system of post-tensioning. **(10 Marks)**

b. State the advantages of pre-stressed concrete over reinforced cement concrete. **(10 Marks)**

6 A PSC beam of inverted T-section has the full dimensions of rib 300 × 900mm, flange 300 × 600mm. The beam is simply supported over a span of 15m. The beam is post tensioned with 3 freyssinet cables each containing 12 wires of 7mm diameter at 150mm, placed at 150mm from soffit of mid span of beam. If initial prestress is 1kN/mm^2. Calculate the maximum Udl that beam can carry, if max compressive stress in concrete is limited to 15MPa and tensile stress is limited to 1MPa. Assume 15% loss of prestress. **(20 Marks)**

7 A prestressd concrete beam 200mm wide and 300mm deep is used over an effective span of 6m to supports an imposed load of 4kN/m. The density of concrete is $24kN/m^3$. At the quarter span section of beam find the magnitude of prestress force when the bottom fibres stress is zero, for following cases:

i) Concentric prestressing force.

ii) Eccentric prestressing force if e = 50mm. **(20 Marks)**

8 a. Explain the following losses in pre-stressing system with relevant formula:

i) Elastic deformation of concrete

ii) Shrinkage

iii) Loss due to creep

iv) Loss due to friction. **(12 Marks)**

b. A PSC beam 250mm wide and 400mm deep is pre-stressed with wires of area $400mm^2$ located at constant eccentricity of 50mm. The initial stress in wire is 1000MPa. The beam is simply supported over a span of 12m. Calculate losses of stress if the beam is post tensioned. Use following data:

$E_s = 210kN/mm^2$

$E_c = 35kN/mm^2$

Relaxation of steel stresses = 5% of initial stress

Shrinkage of concrete = 0.00025

Creep coefficient = 1.6

Slip at anchorage = 2mm

Frictional coefficient = 0.0015/m for wave effect. **(08 Marks)**

* * * * *