

Total No. of Questions : 6]

SEAT No. :

P5005

[Total No. of Pages : 2

TE/Insem.-503
T.E. (Civil)
STRUCTURAL DESIGN - I
(2012 Pattern) (Semester - I)

Time : 1½ Hour]

[Max. Marks : 30

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6.*
- 2) *Neat sketches must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Take Fe 410 grade of steel.*
- 5) *Take ultimate stress in bolt, $f_{ub} = 400 \text{ N/mm}^2$.*
- 6) *Assume suitable data, if necessary.*
- 7) *Use of electronic pocket calculator IS: 800-2007 and steel table allowed.*
- 8) *Use of cell phone is prohibited in the examination hall.*

- Q1)** a) Explain in brief different type of steel structure with suitable sketch. [4]
b) Check the adequacy of an ISA $90 \times 90 \times 8$ @ 10.8 kg/m to carry factored tensile load of 370 kN for yielding and block shear only. Assume angle is connected to 10 mm thick gusset plate by 4 numbers of M20 black bolts of 4.6 grades. [6]

OR

- Q2)** Design a double equal angle section for a tie member of a roof truss connected on each side of 10 mm thick gusset plate to carry an axial tension of 400 kN. Also design connection using M20 black bolts of 4.6 grades. [10]
- Q3)** a) State and explain parameter which affects design strength of compression members. [4]
b) A column 6m long has to support an axial factored load of 800 kN. The column is effectively held in position at both ends and restrained in direction at one end. Design the column using I section. [6]

P.T.O.

OR

- Q4)** a) A built up column of length 8 m carries a factored load of 1800 kN. It consists of two channels ISLC 350 @ 38.8 kg/m back to back at a distance of 220 mm. The column is restrained in position at both ends and restrained against rotation at one end. Design the single lacing system of column. [5]
- b) A 5 m long column is restrained in translation but not in rotation at both ends. If an ISHB 350 @ 67.4 kg/m is used, calculate design compressive strength of the column. [5]
- Q5)** Design a slab base for the column consisting of ISHB 400@77.4 kg/m carrying an axial factored load of 1100 kN. Use M20 grade of concrete. [10]

OR

- Q6)** Check the adequacy of ISHB 450 @ 92.5 kg/m to carry a factored axial compressive load of 750 kN and factored bending moment of 200 kNm about major axis. The effective length of column is 3 m. Consider only section strength. [10]

