

Total No. of Questions : 6]

SEAT No. :

P3

[Total No. of Pages : 2

**Oct.-16/TE/Insem.-3**  
**T.E. (Civil) (Semester - I)**  
**STRUCTURAL DESIGN - I**  
**(2012 Pattern)**

*Time : 1½ Hours]**[Max. Marks : 30**Instructions to the candidates:*

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6.*
- 2) *Neat sketches must be drawn wherever necessary.*
- 3) *Figures to the right side 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 are allowed.*
- 8) *Use of cell phone is prohibited in the examination hall.*

- Q1)** a) Explain in brief design philosophy of limit state method for strength and serviceability. [4]
- b) Design bolted connection for single angle ISA  $90 \times 90 \times 6 \text{ mm}$  @  $8.2 \text{ kg/m}$  carrying factored axial tension  $115 \text{ kN}$  with  $8 \text{ mm}$  thick gusset plate. Use M16 bolt of property class 4.6. [6]

OR

- Q2)** a) State the expression to calculate the net area of plate if the bolts are provided in a staggered pitch with suitable sketch. [3]
- b) Design a double angles tension members connected on each side of  $10 \text{ mm}$  thick gusset plate to carry an axial load of  $340 \text{ kN}$ . Use fillet weld for connection. [7]
- Q3)** a) Differentiate lacing and battening in built up column section on the basis of general and design consideration. [4]
- b) Design a single angle discontinuous strut which is carrying factored load of  $100 \text{ kN}$ . Unsupported length of member is  $3 \text{ m}$ . [6]

*P.T.O.*

OR

- Q4)** a) A 3.5 m long column is restrained against translation and rotation at both the ends. If an ISHB 350 @ 72.4 kg/m is used, calculate design compressive strength of the column. [4]
- b) A column 8 m long consisting 2 ISMC 350 @ 42.1 kg/m spaced 220 mm back to back to carry a factored load of 1200 kN. The column is restrained in translation but not in rotation at both ends. Design a suitable lacing system. [6]
- Q5)** A column ISHB 350 @ 67.4 kg/m carries an axial compressive factored load of 1700 kN. Design a suitable gusseted base. The base is rest on M20 grade of concrete pedestal. Use 20 mm diameter of bolt for connection. Draw the design details. [10]

OR

- Q6)** Design a column of building frame with an effective length of 3.2 m subjected to a factored axial load 600 kN and factored bending moment 45 kNm. Check section strength only. [10]

