301003

Seat No.	

T.E. Civil (Semester – I) Examination, 2014
(2008 Course)
STRUCTURAL DESIGN – I

Time : 4 Hours Max. Marks : 100

Instructions : *1) Attempt Q. **1** or Q. **2**, Q. **3** or Q. **4** from Section **I** and Q. **5** or Q. **6**, Q. **7** or Q. **8** from Section – **II**.*
*2) Answers to the **two** sections should be written in **separate** answer books.*
*3) Neat diagram should be drawn **wherever** necessary.*
*4) Figures to the **right** indicate **full** marks.*
5) Take f_e 410 grade of steel.
6) Take ultimate stress in bolt, $f_{ub} = 400\ N/mm^2$.
*7) **Use** of electronic pocket calculator IS : 800 – 2007 and steel table is **allowed**.*
*8) **Use** of cell phone is prohibited in the examination hall.*

SECTION – I

1. a) Explain in detail gauge line, gauge distance, pitch, edge distance and end distance with sketch. **10**

   b) Design a double angle section to carry a tension of 300 kN. The end connection is to be made using M20 bolt of class 4.6. Assume that the angles are provided on both side of gusset plate. **15**

OR

2. a) Explain in brief different type of steel structures with sketches. **6**

   b) Explain the classification of cross section and hence find class of ISHB 225 @ 43.1 kg/m. **6**

   c) A tension member consist of single ISA 100 × 100 × 10 mm @ 10.8 kg/m is connected to a 12 mm thick gusset plate using M20 bolt of class 4.6 in a single line. Determine the design strength using bolted connection. **13**

3. a) Design a single section to carry a compression of 100 kN. The centre to centre distance between the end connections is 2 m. Also design the end connection. **10**

   b) A column ISHB 350 @ 661.2 N/m carries an axial compressive factored load of 1700 kN. Design a suitable bolted gusset base. The base rests on M15 grade concrete pedestal. Use 24 mm diameter bolts of grade 4.6 for making the connections. **15**

OR

4. Design a built up column of the effective length of 5 m to carry an axial load of 900 kN using two channel section placed back to back. Also design the suitable lacing system and connection using fillet weld. **25**

P.T.O.

SECTION – II

5. a) Determine the design bending strength of ISLB 350 @ 486 N/m considering the beam to be laterally unsupported. The design shear force V is less than the design shear strength. The unsupported length of the beam is 3.0 m. **15**

   b) A simply supported steel joist of 4.0 m effective span is laterally supported. It carries a total uniformly distributed load of 40 kN/m inclusive self weight. Design an appropriate section using I-section. **10**

   OR

6. a) Design a laterally supported beam of effective span 6 m for the following data.
   Maximum bending moment M = 150 kNm
   Maximum shear force V = 210 kN. **15**

   b) An ISLB 300 @ 369.8 N/m transmits an end reaction of 385 kN, under factor load, to the web of ISMB 450 @ 710.2 N/m. Design a bolted framed connection. **10**

7. Design a welded plate girder 24 m in span and laterally restrained throughout. It is subjected to uniformly distributed load 100 kN/m over entire span. Design the girder without intermediate transverse stiffeners. Design the cross section, the end bearing stiffeners and connections between flange and web. **25**

   OR

8. Determine the panel point dead, live and wind load for a simple fink type roof truss for an industrial building for the following data. Design suitable Purlin. **25**

Length of building	48 m
Span of truss	16 m
Spacing of trusses	8 m
Rise of truss	1/4 of span
Self weight of purlin	318 N/m
Asbestos cement sheets of dead weight	171 N/m^2
Location	Allahabad
Life of structure	50 years
Terrain category	3
Height of columns	11 m