Total No. of Questions : 8]

SEAT No. :

P2247

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[4758] - 3
T.E. (Civil)
STRUCTURAL DESIGN - I
(2008 Course) (Semester - I) (301003)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 or Q8.***
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 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.***

SECTION - I

Q1) a) State the advantage and disadvantage of the steel structures. **[5]**

b) Explain in detail gauge line, gauge distance, pitch, edge distance and end distance with sketch. **[10]**

c) Determine the design strength of tension member of roof truss consists of 2 ISA 100 × 100 × 10mm @ 14.9 kg/m connected to 10mm thick gusset plate by 6mm fillet weld. **[10]**

OR

Q2) a) State and explain in brief limit state of serviceability. **[5]**

b) Explain the classification of cross section and hence find class of ISMC 300 @ 35.8 kg/m. **[5]**

c) Design a tension member to carry factor tensile force of 400 kN using two angles sections back to back on either side of gusset plate with longer legs outstanding. The length of the member is 2.9m. **[15]**

Q3) a) Design a single angle section to carry a compression of 100kN. The centre to centre distance between the end connections is 1.2 m. Also design the welded end connection. **[10]**

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b) A column ISHB 350@ 67.4 kg/m carries an axial compressive factored load of 1200 kN. Design a bolted gusseted base. The base rests on M20 grade concrete pedestal. Use 22 mm diameter bolts of grade 4.6 for the connections. **[15]**

OR

Q4) Design a built up column of the effective length of 6m to carry an axial load of 1000kN using two channel sections placed face to face. Also design the suitable lacing system and connection using fillet weld. **[25]**

SECTION - II

Q5) a) State and explain the following in brief with sketches. **[10]**

i) Laterally supported (restrained) beam

ii) Laterally unsupported (unrestrained) beam

iii) Web buckling

iv) Web crippling

b) Determine the design bending strength of ISLB 350@ 49.5 kg/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 4.0m. **[15]**

OR

Q6) a) An ISLB 300@ 37.7 kg/m transmits an end reaction of 385 kN, under factor load, to the web of ISMB 450 @ 72.4kg/m. Design a bolted framed connection. **[10]**

b) A steel floor beam in a building has a span of 8m. It is simply supported over supports and carries a uniformly distributed load 30 kN/m including self weight. Design the beam if the compression flange is laterally restrained throughout the span. **[15]**

Q7) A simply supported welded plate girder carries a uniformly distributed load of 40 kN/m. Effective span of plate girder is 20m. Design an economical cross section, curtailment of flange plates and end bearing stiffeners. Draw the design sketches. **[25]**

OR

Q8) 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	30 m
Span of truss	12 m
Spacing of trusses	4 m
Rise of truss	1/5 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	11m