S – 2014

Total No. of Pages : 3

Seat No.	

T.E. (Civil) (Semester - V) Examination, December - 2015

DESIGN OF STEEL STRUCTURES

Sub. Code : 45536

Day and Date : Tuesday, 08 - 12 - 2015 **Total Marks : 100**

Time : 02.30 p.m. to 05.30 p.m.

Instructions : 1) Solve any three questions from Section - I and any three from Section - II.
2) Use of IS:800-1984, IS:800-2007, IS:875-1987 (Parts 1 to 5). Steel Table is permitted.
3) Assume suitable data if required.
4) Draw sketches wherever necessary.
5) Figures to the right indicate full marks.

SECTION - I

Q1) a) Draw a neat sketches and explain use of following : **[6]**

i) ISA 90 × 60 × 6
ii) ISMC 125
iii) ISMB 300

b) Enlist the loads acting on structure. How will you calculate dead load and live load acting at panel point of roof truss? **[11]**

Q2) a) Explain term "Net Effective Area". Find net effective area for an angle ISA 65 × 65 × 6 mm connected by welding to a 8 mm thick gusset plate. **[6]**

b) Design a tension member for a pull of 500 kN. Use single unequal angle connected to gusset plate with welded connection. Length of member is 2.1 m. Check also for slenderness ratio limit. **[10]**

Q3) a) Determine strength of member in axial compression for of 2 ISA 60 × 60 × 6 mm connected on either side of gusset plate with welding, length of member is 1.4 m. **[8]**

b) Design a strut for 300 kN. Use single equal angle, with single bolted to gusset plate. Length of member is 1.5 m. **[8]**

P.T.O.

Q4) a) What do you mean by laterally restrained beam? **[4]**

b) A simply supported beam spanning 8 m is made of ISMB 500 with double cover plate of size 250 × 8 mm to each flange. Calculate the maximum UDL beam can carry on its whole span if compression flange of the beam is supported laterally throughout span. Check beam for shear and deflection. **[13]**

SECTION - II

Q5) Determine the design forces (maximum BM and max SF) due to vertical loads and lateral forces for the gantry girder with following data : **[16]**

Span of crane bridge = 20 m
Span of gantry girder = 4 m
Wheel base = 5.3 m
Wt. of crane bridge = 250 kN
Wt. of trolley and hook = 60 kN
Load lifting capacity of gantry girder = 160kN
Minimum approach of hook = 0.8 m
Weight of rail = 0.3 kN/m
Height of rail = 75 mm

Q6) a) Determine the optimum spacing and then axial compression load carrying capacity of a battened built up column consisting of two ISHB 350 @ 67.4 kg/m each. The effective length of the column is 6 m. **[8]**

b) A steel stanchion, consisting of ISHB 350 @ 67.4 kg/m carries an axial load of 400 kN and moment of 50 kNm in the plane of the web. Design the base of the column. Assume the dimension of the base parallel to web is 570 mm. The safe bearing pressure on concrete footing is $4N/mm^2$. **[10]**

Q7) a) Distinguish between the working stress method and limit state method of design. **[4]**

b) When you go for designing double lacing system instead of single lacing system for built column. **[4]**

c) What are the partial safety factors? Explain. **[4]**

d) Explain possible failure modes of axially loaded columns. **[4]**

Q8) a) A bottom tie in a roof truss, 1.5 m long consists of two unequal angles 2 ISA 100, 75, 6 placed on either side of 10 mm thick gusset with longer legs vertical, each connected by 4 mm side fillet welds, at the top 140 mm long and at the bottom 310 mm long. Determine the factored tensile load carrying capacity of the tie member. **[8]**

b) A single angle discontinuous strut is to carry a factored axial compression of 180 kN. The length of the strut between centers of intersection is 1.45 m. It is connected to 10 mm thick gusset by side fillet weld. Design the strut by limit state method of design. **[8]**

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