Total No. of Questions : 8]

SEAT No. :

P2380

[Total No. of Pages :3

[5153]-3
T.E. (Civil)
STRUCTURAL DESIGN - I
(2008 Course) (Semester - I)

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

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8.***
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 and explain type of steel structures with neat sketches. **[5]**

b) State and explain classification of cross section with bending stress diagram and classify **[10]**

i) ISHB 200 @ 37.3 kg/m

ii) ISMC 300 @ 35.8 kg/m.

c) Determine design tensile strength of 2-ISA 90×90×12 mm connected back to back to the gusset plate of thickness 12 mm by 5 number of M20 black bolts of 4.6 grade. **[10]**

OR

Q2) a) Differentiate between bolted and welded connection. **[5]**

b) State and explain the advantages of high strength bolts. **[5]**

c) Design a double angle section to carry a tension of 310 kN. The end connection is to be made by using M20 bolts of class 4.6. Assuming the angles is provided on both side of gusset plate. Draw the design details. **[15]**

P.T.O.

Q3) a) A strut 3.8 m long consist of 2-ISA 100×100×8 mm connected to each side of 12 mm thick gusset plate by fillet weld. Calculate design strength of the member. **[10]**

b) Design a built up column 8 m long to carry a factored axial load of 1800 kN. The column is restrained in position but not in direction at both the ends. Design a column by using two channels face to face and single lacing with bolted connections. **[15]**

OR

Q4) Design a gusseted base for a built up column ISHB 350 @ 67.8 kg/m with two plates 450×22 mm carrying an axial factored load of 3000 kN. The column is supported on concrete pedestal of M20 grade. Draw the design sketches.**[25]**

SECTION - II

Q5) a) Design a laterally supported beam of effective span 6 m for the following data: **[10]**

Maximum BM, M = 150 kNm and Maximum SF, V = 210 kN.

b) A column having an effective length of 3.5 m is subjected to factored axial load of 450 kN and factored bending moment of 50 kNm. Design the Column section and check for section strength only. **[15]**

OR

Q6) a) Calculate the magnitude of uniformly distributed load on a laterally unsupported beam ISLB 400 @ 558.2 kg/m for an effective length of 4 m. **[10]**

b) Explain with neat sketches Laterally supported beam, Laterally unsupported beam, web buckling and web crippling failure. **[15]**

Q7) A truss shown in Fig. 7 is used for an industrial building covered with AC sheet located at Pune. Calculate the panel point dead, live and wind load. Also design the members L_0L_1, U_1L_1 and L_0U_1, assuming spacing of trusses 3m, $k_1 = 1$, $k_2 = 0.98$, $k_3 = 1$, d (Cpe – Cpi) = $\pm$ 0.8. Draw the design sketches. **[25]**

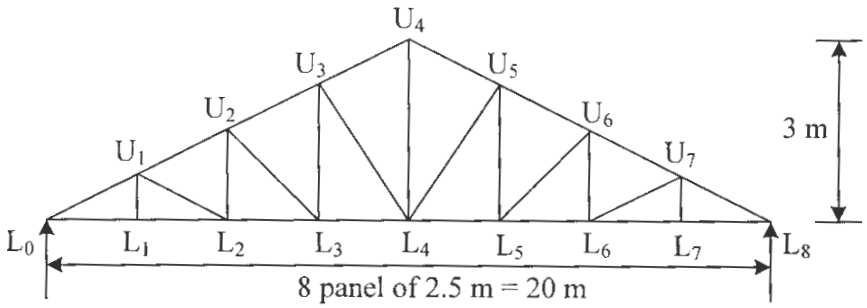

Fig. 7

OR

Q8) A simply supported welded plate girder of an effective span of 24 m subjected to uniformly distributed load 35 kN/m throughout the span excluding the self weight of plate girder. Assume compression flange laterally supported throughout the span. Design cross section of plate girder, stiffeners and connections. Draw sectional plan and elevation. **[25]**