Total No. of Questions :8]

SEAT No. :

P2802

[Total No. of Pages :3

[4958] - 103

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 are allowed.***
8) ***Use of cell phone is prohibited in the examination hall.***

SECTION - I

Q1) a) State and explain in brief advantage of steel structures. **[5]**

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

i) ISHB 400 @ 77.4 kg/m.

ii) ISMC 350 @ 38.8 kg/m.

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

OR

P.T.O.

Q2) a) State and explain in brief disadvantage of steel structures. **[5]**

b) State and explain the advantages of welded connection. **[5]**

c) Design a double angle section to carry a factor tension of 300 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]**

Q3) a) A strut 3.0 m long consist of 2-ISA 100×100×10 mm connected to each side of 10 mm thick gusset plate by fillet weld. Calculate design strength of the member. **[10]**

b) Design a built up column 10 m long to carry a factored axial load of 1200 kN. The column is restrained in position but not in direction at both the ends. Design a column by using two channels back to back and single lacing with bolted connections. **[15]**

OR

Q4) Design a gusseted base for a built up column ISHB 350 @ 67.4 kg/m with two plates 450×20 mm carrying an axial factored load of 2500 kN. The column is supported on concrete pedestal of M20 grade. Draw the design sketches.**[25]**

SECTION - II

Q5) a) Calculate the magnitude of uniformly distributed load on a laterally supported beam ISLB 400 @ 56.9 kg/m for an effective length of 4 m. **[10]**

b) A column having an effective length of 3.2 m is subjected to factored axial load of 400 kN and factored bending moment of 50 kNm. Design the Column section and check for section strength only. **[15]**

OR

Q6) a) Design a laterally supported beam of effective span 6 m for the following data: **[13]**

Maximum B M, M = 180 kNm and Maximum SF, V= 250 kN.

b) Explain with neat sketches Laterally supported beam, Laterally unsupported beam, web buckling and web crippling failure. **[12]**

Q7) A truss shown in Fig. 7 is used for an industrial building covered with A C sheet of self weight 180 N/m^2 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 4 m, $k_1 = 1$, $k_2 = 1$, $k_3 = 1$, d (Cpe – Cpi) = ± 1.0. Draw the design sketches. **[25]**

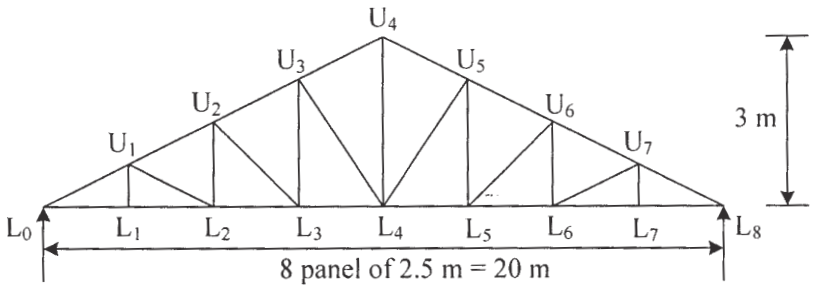

Fig. 7

OR

Q8) A simply supported welded plate girder of an effective span of 24 m subjected to uniformly distributed load 30 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, end stiffeners and connections between flange and web plate. Draw sectional plan and elevation with connection details. **[25]**