Total No. of Questions : 10] **SEAT No. :**

P3973 **[Total No. of Pages : 3**

[5353]-503
T.E. (Civil) (Semester - I)
STRUCTURAL DESIGN - I
(2012 and 2015 Pattern)

Time : 3 Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.***
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/mm².***
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.***

Q1) a) Explain modes of failure in compression member with sketch. **[5]**

b) Determine design tensile strength of an ISA 125 × 95 × 10 @16.5 kg/m in which longer leg connected to the gusset plate of thickness 12 mm by 3 number of M20 black bolts of 4.6 grade. **[5]**

OR

Q2) a) Why partial safety factors are used in LSM instead of factor of safety. **[5]**

b) Check the adequacy of an ISA 90 × 60 × 6 @ 6.8 kg/m to carry factored axial tensile load of 150 kN for yielding and block shear only. Assume angle is connected to 8 mm thick gusset plate by 4 numbers of M20 bolts. **[5]**

Q3) a) A 5 m long column is effectively held in position at both ends and restrained against rotation at one end. If an ISHB 350 @ 67.4 Kg/m is used, Calculate design compressive strength. **[5]**

b) Define a beam-column member with suitable examples and draw with the sketches. **[5]**

P.T.O.

OR

Q4) Design the slab base for a column ISHB 350 @ 66.1 kg/m supporting a factored axial compression of 1500 kN. Consider grade of concrete as M20. Take width of base plate as 410 mm. **[10]**

Q5) Calculate safe uniformly distributed load over a laterally supported beam ISMB 400@61.6 kg/m for an effective length of 5 m. Also check for serviceability.**[16]**

OR

Q6) a) Explain modes of failure in beams. **[6]**

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

i) factor moment M = 120 kNm

ii) factor shear force V = 200 kN

Q7) a) Explain types of beam to beam and beam to column connections with suitable sketches. **[7]**

b) Design a bolted stiffened seat connection for the factored beam end reaction 120 kN. The beam section is ISMB 250 @ 37.3 kg/m connected to the flange of the column section ISHB 200@ 37.3kg/m. **[10]**

OR

Q8) A simply supported welded plate girder of an effective span of 24 m subjected to factored uniformly distributed load 50 kN/m throughout the span including the self weight of plate girder. Assume compression flange laterally supported throughout the span and yield stress of steel is 250 MPa. Design cross section of plate girder, stiffeners and connections. Draw sectional plan and elevation.**[17]**

Q9) Determine the maximum wheel load, shear force and bending moment for the gantry girder as per the following data. Design the section and check for moment capacity of the section. Weight of crane girder: 150 kN, crane capacity: 180 kN, weight of crab and motor: 50 kN, span of crane girder: 15 m. minimum hook approach: 1 .2m, center to centre between gantry column: 5m, Weight of rail: 0.25 kN/m. **[17]**

OR

Q10) A truss shown in Fig.10 is used for an industrial building situated at Pune covered with AC sheets. Calculate the panel point dead, live, and wind load. Design the members $L_7 L_8$, $U_7 L_8$ and $L_7 U_7$. Assuming (Cpe – Cpi) = ± 0.8, $k_1 = 1$, $k_2 = 0.98$, $k_3 = 1$ and $f_y = 250$ MPa. Draw the design sketches. **[17]**

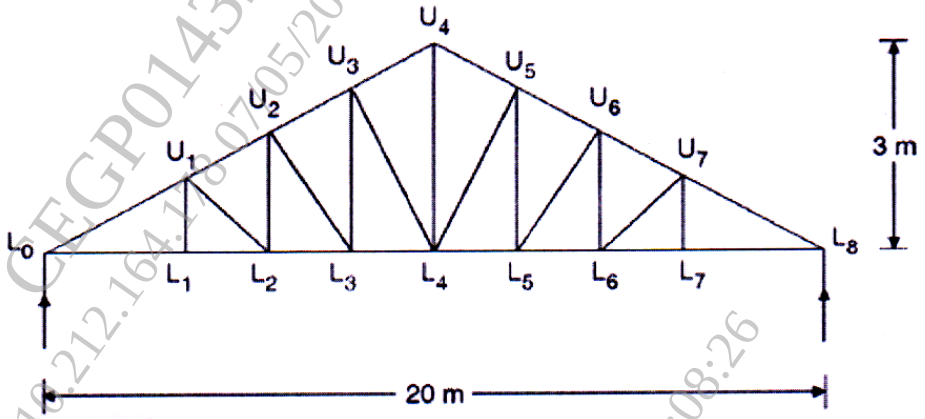

Fig. 10