Total No. of Questions : 10]

SEAT No. :

P2392

[Total No. of Pages : 2

[5253] - 103
T.E. (Civil)
STRUCTURAL DESIGN - I
(2012 Pattern) (Semester - I)

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

Instructions to the candidates :

1) ***Answer Q.l 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 tension member with sketch. **[5]**

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

OR

Q2) a) Why Limit state method is more rational than working stress method. **[5]**

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

Q3) a) A 6 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 of the column. **[5]**

b) Define a beam—column member and give examples with suitable sketches. **[5]**

OR

Q4) Design the gusseted base for a column ISHB 350 @ 66.1 kg/m supporting a factored axial compression of 1700 kN. Consider grade of concrete as M20 and gusset angle ISA 150 x 115 x 15mm. **[10]**

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

P.T.O.

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: (i) Maximum bending moment M= 150 kNm (ii) Maximum shear force V= 210 kN. **[10]**

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

b) Design a bolted 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 @ 37.3 kg/m. **[10]**

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 and yield stress of steel is 250 MPa. Design cross section of plate girder, end bearing stiffeners. 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: 1.2 m, center/center distance between gantry column: 5 m, Weight of rail: 0.25 kN/m **[17]**

OR

Q10) A truss shown in Fig. 10 is used for an industrial building and spaced at 3m situated at Pune. The truss is covered with AC sheets calculate the panel point dead, live, and wind load. Design the members L_0 L_1, U_1L_1 and L_0 U_1. Assuming k_1 = 1, k_2=0.98 and k_3=l and (Cpe — Cpi) = ± 0.8, f_y = 250 MPa. Draw the design sketches. **[17]**

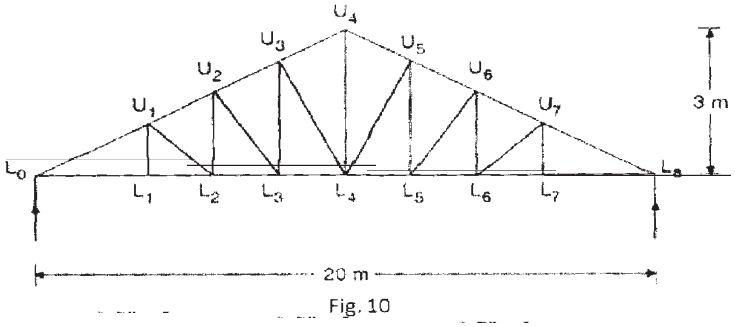

Fig. 10