Total No. of Questions : 10]

SEAT No. :

P3693

[Total No. of Pages : 3

[5460]-103
T.E. (Civil) (Semester - I)
STRUCTURAL DESIGN - I
(2012 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/mm^2.***
6) ***Assume suitable data, if necessary.***
7) ***Use of electronic pocket calculator IS: 800-2007 and steel table allowed.***

Q1) a) Explain shear lag effect with neat sketch. **[5]**

b) Check the adequacy of an ISA 90 × 90 × 6 @ 8.2 kg/m to carry factored axial tensile load of 350 kN for yielding and rupture only. Assume angle is connected to 8 mm thick gusset plate by 5 mm fillet weld. **[5]**

OR

Q2) a) Explain advantages of limit state method over working stress method of design. **[4]**

b) Determine design compressive strength of 2-ISA 70 × 70 × 6 @ 6.33 kg/m connected on either side to the gusset plate by 3 number of M20 black bolts of 4.6 grades. Assume Effective length of member 1.2 m. **[6]**

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 300 @ 58.76 kg/m is used, calculate design compressive strength. **[6]**

b) Define a beam-column with suitable examples and sketch. **[4]**

OR

Q4) Design the gusseted base for a column ISHB 450 @ 87.2 kg/m supporting a factored axial compression of 1800 kN. Use grade of concrete as M20. **[10]**

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Q5) Calculate the uniformly distributed load over a laterally unsupported beam ISMB 600 @ 122.46 kg/m for an effective length of 5 m. Also check for serviceability. **[16]**

OR

Q6) a) Explain web buckling and web crippling with neat sketches. **[6]**

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

i) Maximum factor moment, M = 150 kNm

ii) Maximum factor shear, V= 210 kN

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 30 kN/m throughout the span excluding the self weight of plate girder and central point load of 500kN. Assuming compression flange is laterally supported throughout the span, design cross section of plate girder and load bearing stiffener. Draw sectional plan and elevation. **[17]**

Q9) Determine the factor 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: 200 kN, crane capacity: 200 kN, weight of crab and motor: 50 kN, span of crane girder: 20 m, minimum hook approach: 1.5 m, center/center distance between gantry columns: 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 5 m situated at Pune. The truss is covered with GI sheets calculate the design forces and design the member L_0L_1, L_0U_1 and U_1L_1. Assuming $k_1 = 1$, $k_2 = 0.98$ and $k_3 = 1$ and (Cpe - Cpi) = $\pm$ 1.2, $f_y = 250$ MPa. Draw the design sketches. **[17]**

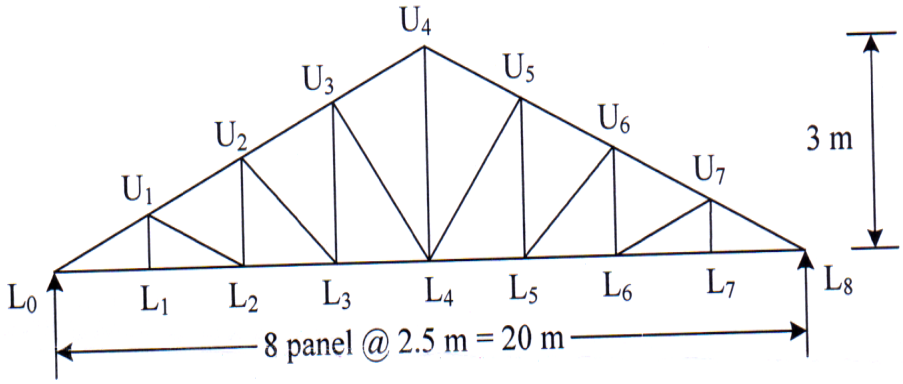

Fig. 10