Total No. of Questions : 10]

SEAT No. :

P1686

[Total No. of Pages : 3

[5460]-503
T.E. (Civil)
STRUCTURAL DESIGN - I
(2015 Pattern) (Semester - I)

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 classification of sections by using moment curvature graph and bending stress diagram. **[4]**

b) Determine design tensile strength of 2-ISA 125 × 95 × 10 @ 16.5 kg/m in which longer leg connected back to back to the gusset plate of thickness 12 mm by 3 number of M20 black bolts. **[6]**

OR

Q2) a) Differentiate working stress method and limit state method of design. **[4]**

b) Check the adequacy of an ISA 90 × 60 × 6 @ 6.8 kg/m to carry factored axial tension of 200 kN. Assume angle is connected to 8 mm thick gusset plate by 4 numbers of M20 bolts and effective length of member is 1.8 m. **[6]**

Q3) a) A 5 m long is effectively held in position at both ends and restrained against rotation at one end. If 300 × 20 mm cover plates are connected on both sides of an ISHB350 @ 67.4 kg/m. Calculate design compressive strength of the column. **[5]**

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

P.T.O.

OR

Q4) Design the slab base for a column ISMB 350 @ 66.1 kg/m supporting a factored axial compression of 1200 kN. Consider grade of concrete as M20. **[10]**

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

OR

Q6) a) Explain web buckling and web crippling developed in beams. **[6]**

b) Design a laterally unsupported beam of effective span 4 m subjected to 100 kN/m uniformly distributed load including self weight on entire span. **[10]**

Q7) a) Design a welded connection for the factored beam end reaction 100 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. **[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 30 m subjected to factored uniformly distributed load 60 kN/m througout 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: 1.2 m, centre to centre distance 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 is covered with GI sheets. Determine the panel point dead, live, and wind load. Design the members L_0 L_1, U_1 L_0 and L_1 U_1. Assuming P_z = 1000 kN/m^2 F_y = 250 MPa. Draw the design sketches. **[17]**

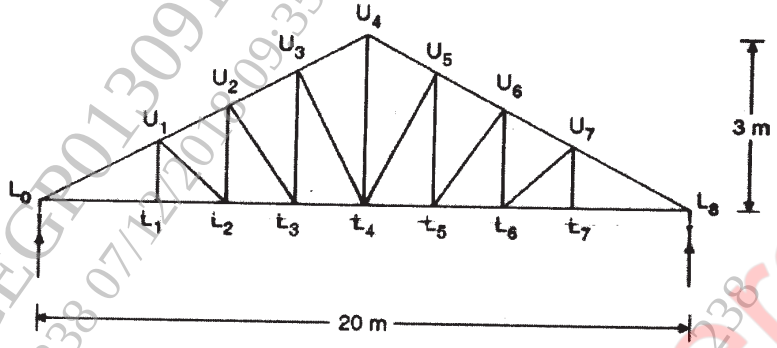

Fig. 10