Total No. of Questions :10]

SEAT No. :

P2538

[Total No. of Pages :3

[5153] - 503

T.E. (Civil)

STRUCTURAL DESIGN - I

(2012 Course) (Semester - I) (End Semester)

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

Q1) a) Explain in brief limit strength due to yielding and rupture with suitable sketch. **[4]**

b) Explain in brief gross and net area in shearing for block shear with suitable sketch. **[2]**

c) Differentiate lacing and battening of built up column section. **[4]**

OR

Q2) a) Determine the tensile strength of a member of roof truss 2 ISA 90×90×12 mm connected to 12 mm thick gusset plate by fillet weld on either side. **[6]**

b) Define effective length of compression member using single and double angle sections. **[4]**

Q3) a) Design a column using I-section of length 5 m subjected to an axial compressive force of 1175 kN resulting from dead load and live load. One end of the column is fixed and other end is pinned. **[4]**

b) Design a slab base for a column ISHB 350 @ 661.2 N/m carrying a factored load of 1200 kN. Concrete grade is M_{20} and steel of fe_{410}. **[6]**

OR

P.T.O.

Q4) a) Design a 10 m long column using two channels back to back to carry a factored load 1100 kN. The column is restrained in position but not in direction at both ends. **[4]**

b) Design a column of building frame with an effective length 3.5 m subjected to a factored axial load 450 kN and factored bending moment 60 kNm. Check for section strength only. **[6]**

Q5) a) Explain in brief design check for web buckling, web crippling and serviceability to the design of laterally supported beam. **[6]**

b) A simply supported beam of effective span 8 m carries uniformly distributed load w kN/m throughout the span. The compression flange is laterally unsupported throughout the span. Determine intensity of uniformly distributed load w so that ISMB 400 @ 61.6 kg/m provided for beam can carry safely. **[10]**

OR

Q6) a) Define laterally restrained and unrestrained beam with suitable sketch. **[4]**

b) A simply supported beam of effective span 5 m carries a factored uniformly distributed load 50 kN/m. The section is laterally supported throughout the span. Design the beam using I-section and check for serviceability condition. **[8]**

Q7) a) Explain in brief design steps for the design of curtailment of flange plate. **[4]**

b) A beam ISMB 450 @ 72.4 kg/m transmit an end reaction of 120 kN to the column ISHB 300 @ 58.8 kg/m. Design seated bolted connection using M20 bolts of 4.6 grade. **[12]**

OR

Q8) Design the cross secion with usual check and connection of flange plate to web plate for a welded plate girder for an effective span of 24 m. The girder is loaded with a uniformly distributed load 30 kN/m due to dead load and live load. Draw cross section and connection in sectional plan. **[16]**

Q9) A truss shown in Fig.9 is used for an industrial building covered with AC sheet of self weight 150 N/m^2 located at Mumbai. Calculate the panel point dead, live and wind load. Also determine design forces in the members L_0L_1, U_1L_1 and L_0U_1. Assume spacing of trusses 4 m, $k_1 = 1$, $k_2 = 1$, $k_3 = 1$, (Cpe – Cpi) = $\pm$ 1.2. Draw the design sketches. **[18]**

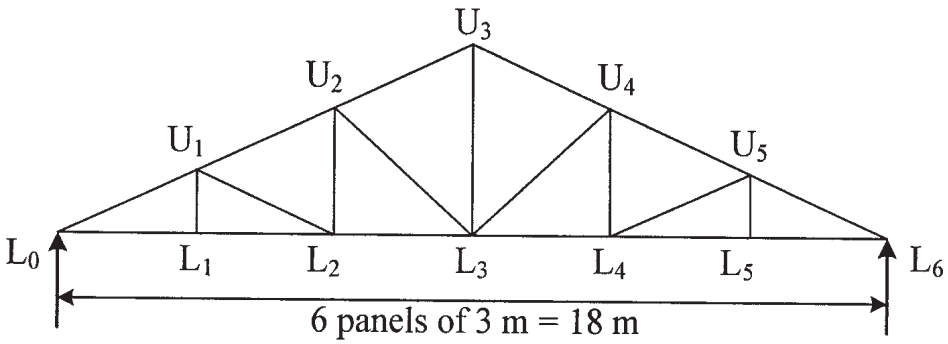

Fig. 9

OR

Q10) Design a cross section of gantry girder to carry electric overhead travelling crane for the following data: **[18]**

Weight of crane girder excluding trolley: 250 kN

Crane capacity: 250 kN

Weight of trolley: 50 kN

Span of crane girder: 12 m

Minimum hook approach: 1.2 m

Spacing of columns: 6 m

Weight of rail: 0.3 kN/m

Wheel base: 3.2 m.

EEE