

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, $f_{ub} = 400 \text{ N/mm}^2$.
- 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 f_{e410} . [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 section 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, $k_1 = 1$, $k_2 = 1$, $k_3 = 1$, $(C_{pe} - C_{pi}) = \pm 1.2$. Draw the design sketches. [18]

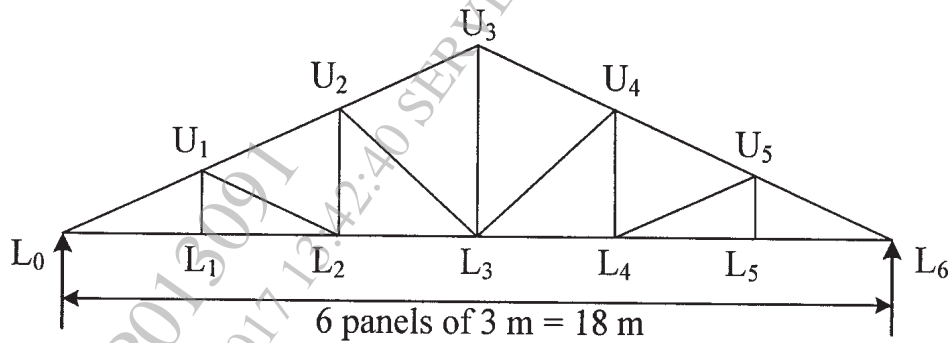


Fig. 9

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