

Total No. of Questions : 10]

SEAT No. :

P2361

[4758] - 503

[Total No. of Pages :3

T.E. (Civil)

STRUCTURAL DESIGN - I

(2012 Course) (End Semester) (301003) (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 and 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)** Determine design strength of tension member consist of 2 ISA $90 \times 60 \times 6$ @ 6.8 kg/m, the longer legs is connected to gusset back to back by means of 3 bolts of 16mm dia in one line. **[6]**
- b) An ISHB 450 @ 87.2 kg/m used as a column to support a factored load of 950 kN. The column has an effective length of 5m with respect to y-axis. Check its suitability. **[4]**

OR

- Q2) a)** Design a double angles tension members connected on each side of 10mm thick gusset plate to carry an axial load of 340 kN. Use M_{20} black bolts of 4.6 Grade. **[6]**
- b) State and explain factor which affect the design strength of compression members. **[4]**
- Q3) a)** Explain in brief the design specification of compression members. **[4]**
- b) Design a base plate for column of ISHB 250 @ 51.0 kg/m carrying a factored load of 650 kN. Assume that the column is supported on a concrete of grade M25. **[6]**

OR

P.T.O.

Q4) a) Determine the design strength of a column ISHB 300@ 58.8 kg/m having a length of 5m. Assume that the bottom of the column is fixed and top is free. [5]

b) Differentiate lacing and battening in built up column on the basis of design criteria. [5]

Q5) a) A simply supported beam spanning 8 m carries a uniformly distributed load 5 kN/m including its self-weight. The compression flange is laterally restrained throughout the span. Design section and check for serviceability. [6]

b) An ISWB 600@ 133.7 kg/m, is used as a laterally unrestrained beam of span 10m subjected to uniformly distributed load of 70 kN/m. Check limit state of strength and serviceability. [10]

OR

Q6) Design a built up section of beam to carry uniformly distributed dead load of 400 kN and an imposed load of 600 kN. The beam is simply supported and has a span of 10m. The overall depth should not exceed 650 mm. Full lateral support is provided for the compression flange. Check for serviceability. [16]

Q7) a) Explain beam to beam and beam to column connection using suitable sketches. [6]

b) A beam ISMB 300@ 44.2 kg/m transmit an end reaction of 100 kN to the column ISMC 200 @ 22.1 kg/m. Design seated bolted connection, using M20 bolts of property class 4.6. [10]

OR

Q8) A simply supported welded plate girder of span 12m is subjected to dead load of 15 kN/m and live load of 30 kN/m. It is also subjected to two point load of 500 kN and 400 kN at 4m from either support. The compression flange is laterally supported throughout the span. Assuming that the depth is limited to 1500 mm for the plate girder, design the cross section and apply appropriate check. Also design the intermediate stiffeners and draw the plan and elevation. [16]

- Q9) a)** Design an I-section purlin, for an industrial building situated in the outskirts of Pune, to support a galvanized corrugated iron sheet roof for the following data: **[10]**

Spacing of truss: 6m

Span of truss : 12m

Spacing of purlins : 1.5 m

Intensity of wind pressure: 2 kN/m²

Weight of G I Sheet : 130 N/m²

- b) Determine the panel point dead load, live load and wind load for an industrial truss as shown in Fig. 9. The design wind pressure is 1200 N/m², the trusses are covered with A C sheet and the centre to centre spacing of truss is 6m. **[8]**

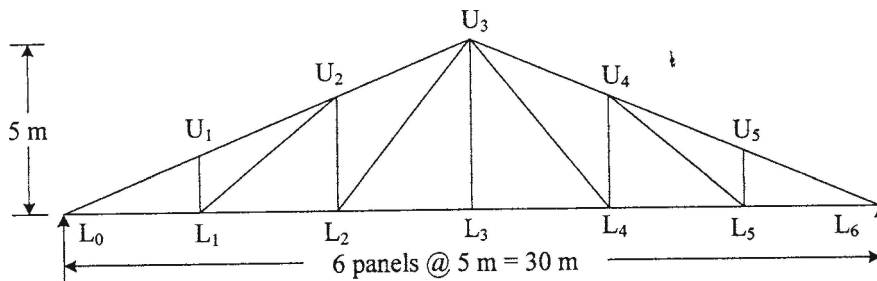


Fig. 9

OR

- Q10)** Design a cross section for simply supported gantry girder to carry electric overhead traveling crane for the following data. Design section should be checked for moment capacity, local capacity, shear capacity, web buckling and deflection. **[18]**

Crane capacity : 280 kN

Weight of crane excluding trolley : 150 kN

Weight of trolley : 120 kN

Minimum approach of crane hook : 1.0 m

Wheel Base: 3m

Distance between center to centre of gantry girders : 14m

Spacing of columns : 7 m

Weight of rail section : 0.3 kN/m

Height of rail section : 75 mm

