UNIVERSITY OF PUNE

[4363]-103

T. E. (Civil) May - 2013

STRUCTURAL DESIGN I

(2008 Pattern)

[Time : 4 Hours] **[Max. Marks : 100]**

Total No. of Questions : 08 **[Total No. of Printed Pages :3]**

Instructions :

(1) Attempt Section I :Q1or Q2, Q3 or Q4, and Section II: Q5 or Q6, Q7 or Q8,

*(2) Answers to the **two sections** should be written in **separate answer-books**.*

(3) Black figures to the right indicate full marks.

(4) Neat diagrams must be drawn wherever necessary.

(5) Take f_e 410 grade of steel.

(6) Take ultimate stress in bolt, f_{ub} = 400 N/mm^2.

(7) Use of electronic pocket calculator IS: 800-2007 and steel table is allowed.

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

SECTION I

Q1) a) Define gauge line, gauge distance, pitch, edge distance and end distance with sketch. [06]

b) State advantages and disadvantages of steel structures. [06]

c) Design the tie of a roof truss subjected to factor design tension, [13]

T = 230 kN using unequal angle section. Centre to centre length of intersection is 2.8 m . Also design the welded connection and draw the design details.

OR

Q2) a) Explain philosophy of limit state design for strength and serviceability. [06]

b) State advantages and disadvantages of welded connection. [06]

c) Determine design strength of tension member consist of 2-ISA [13]

80 x 80 x 8 mm at 9.6 kg/m connected back to back on both side of a 10 mm thick gusset plate by fillet weld.

Q3) a) Design a column to support a factored load of 1100 Kn. The column has as effective length of 7.0 m with respect to z-axis and 5 m with respect to y-axis. [15]

b) Design a slab base for the column consisting of ISWB 300 @ 48.1 kg/m carrying an axial factored load of 1100 kN. Design welded connection between column and base plate. Concrete of grade M_{20} is available. [10]

OR

Q4) a) Design a double angle discontinuous strut to carry a factored load of 135 kN. The centre to centre length of strut is 3 m. The angles are placed back to back on opposite side of gusset plate. Also design the welded connection and draw the design details. [10]

b) Design a built-up column to carry an axial load of 1200 kN resulting from dead load and live load. One end of column is pinned and other is fixed. Centre to centre distance between supports is 5.5 m. Use two channels placed back to back with single lacing connected with bolts. [15]

SECTION II

Q5) a) A simply supported beam of effective span 5 m carries a uniformly distributed load 60 kN/m throughout the span and a central factored point load of 75 kN. The compression flange of beam is laterally supported throughout the span. Design the section and check for shear and deflection. [12]

b) A column having effective length of 3.5 m is subjected to factored axial load of 450 kN and factored moment of 50 kNm. Design the column section. Check for section strength only. [13]

OR

Q6) a) ISMB 400 at 61.6 kg/m is used as a beam simply supported with effective span of 3 m. The compression flange of beam is laterally supported throughout. Determine design strength of the section. [13]

b) An ISLB 325 @ 43.1 kg/m transmit a factored end reaction of 75 kN and a factor end moment of 100 kNm to the flange of a column ISHB 250 @ 54.7 kg/m. Design the bolted connection. [12]

Q7) Design Suitable cross section for welded plate girder for an effective span of 30 m and carrying uniformly distributed load w = 30 kN/m. It is also loaded with two concentrated load of 150 kN acting at 10 m either supports. The compression flange of the girder is laterally supported throughout the span. Also design load bearing stiffener, connection between flange and web plate and draw the design sketches. [25]

OR

Q8) Design L_0U_1, L_0L_1, and U_1L_1 of a truss as shown in Fig. 8 The design wind pressure is 1200 N/m^2, the truss are covered with A C sheet and the centre to centre spacing of truss is 6 m. [25]

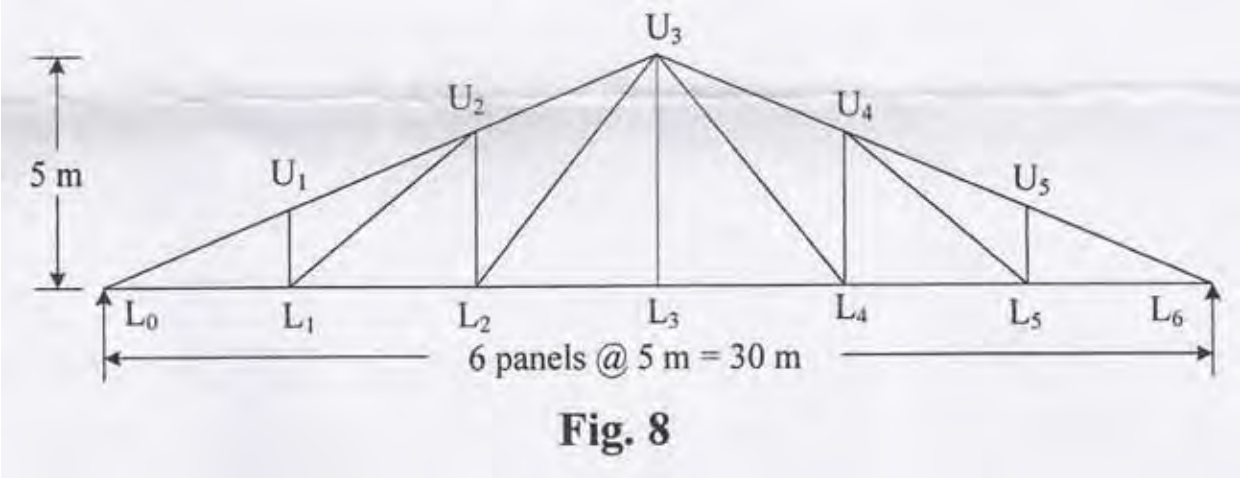

Fig. 8