

GUJARAT TECHNOLOGICAL UNIVERSITY**M. E. - SEMESTER – II • EXAMINATION – SUMMER • 2014****Subject code: 1721507****Date: 23-06-2014****Subject Name: Advanced Steel Structural Design****Time: 02:30 pm - 05:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Use of IS:800, IS:801, IS:811, IS:875, IS:1893, SP6(5) and Steel Table is permitted.

- Q.1 (a)** Differentiate between: **07**
- Hot rolling and cold rolling
 - Production of steel in integrated steel plant and mini steel plant
- (b)** The framing plan of a multistorey building and section details of column and beams are given in figure below. The storey height is 3.5m and the columns are assumed to be fixed at the base. For a column in a typical lower floor of the building, determine the effective length in both directions. For the purpose of estimating the total loads on the columns in the storey, assume a total distributed load of 40 kN/m² from all the floors above (combined). Assume Fe-410 grade steel. **07**
- Q.2 (a)** 1. List the eight loading combinations to be considered and the 13 cases when considering only DL, LL and EL. **07**
2. What are additional eight loading cases to be considered for non-orthogonal building?
3. What are the load combinations considered in plastic design?
- (b)** 1. What makes the brittle fracture to be of utmost concern in welded structures? Explain stress raisers in this context. **07**
2. Explain in detail the various physical and mechanical properties of steel.
- OR**
- (b)** Top chord of welded cold formed light-gauge steel roof truss has average member length 3.5m and subjected to maximum compressive force of 12kN. Proportionate suitable cross-section of chord which should confirm all checks as per IS:801-1975 codal provisions. **07**
- Q.3 (a)** A simply supported plate girder with effective span of 24 m is subjected to uniformly distributed load of 50kN/m and two concentrated load of 180 kN at 1/3 of span. Considering fully restrained condition at both the ends against lateral buckling throughout the span **14**
- A) Design a section with flange plates and 8mm thick web plate.
- B) Check last panel for shear and moment capacity & design end bearing stiffeners.
- OR**
- Q.3 (a)** A plan of a commercial building is as shown in figure below has six floors, each of 3.5m height. The roof is accessible and all the floors are used as offices. Calculate the load on the interior column on the first floor and second floor. Live load on each floor is 4 kN/m² and on roof it is 1.5 kN/m². Assume slab thickness as 150mm and floor finish as 1 kN/m². **07**
- (b)** Design a beam column joint in the longitudinal direction on the interior column for the building shown in figure below. **07**
- Q.4 (a)** Calculate design wind forces using the gust factor approach on a steel multi-storey building 90m tall and plan size 16mx16m to be constructed in Ahmedabad. Assume average storey height to be 3m. The frames are to be spaced at 4m c/c in both directions. **14**

OR

- Q.4 (a)** A through type Pratt truss bridge has simply supported span of 40m with ten panels each of 4m. Top chord joints are U1 to U9 while bottom chord joints are L0 to L10. Diagonal members are 45° inclined to bottom chord. Design any three of following members when a train of 40kN/m longer than span passes from left to right: U3U4, L2L3, U2L3 and U1L1. **14**
- Q.5 (a)** Design a floor joist consisting of two channels welded back to back to form a unstiffened I-section. The effective span of joist is 5.0m. The joist is carrying UDL of 10.0 kN/m and one central point load of 25 kN. Use cold formed light gauge steel section. Design should confirm IS:801-1975. Also apply the necessary checks. **14**

OR

- Q.5 (a)** A non-sway column in a building frame with flexible joints is 5m high and subjected to the following load and moments:
 Factored axial load = 450 kN
 Factored moment at top of column = 30.0 kNm and
 Factored moment at bottom of column = 45.0 kNm
 Design a suitable beam-column assuming $f_y = 250 \text{ N/mm}^2$. Take the effective length of the column as 0.7L along both the axes. **07**
- (b)** Which are the various design consideration governing the strength of the cold formed steel elements. Also explain the behavior of the stiffened elements under compression. **07**


