

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**ME – SEMESTER II (OLD) – • EXAMINATION – SUMMER 2016**

**Subject Code: 1722007****Date: 20/05/2016****Subject Name: Advanced steel Structures****Time: 10:30 am to 01:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Following IS codes and special publications are allowed
  - i) IS800: 2007
  - ii) IS875 (Part III)
  - iii) IS1893 (Part I): 2002
  - iv) SP 1 and/or Steel table

- Q.1** (a) Explain methods of approximate analysis for lateral loads in multi storey buildings with neat sketches. **07**
- (b) A two span continuous beam ABC has span length AB=5m and BC=5m and carries a factored udl of 12kN/m completely covering the spans AB & BC. A & C are fixed supports. Find the section modulus required for 'I' section of the beam needed. Assume yield stress for the material as 250N/mm<sup>2</sup>. **07**

- Q.2** (a) Explain importance of fatigue failure and fatigue assessment in structural steel members as per code. **07**
- (b) A class room is 5mX12m is provided with 150mm RCC slab with 20mm floor finish over rolled steel beams 3m centre to centre. The compression flange is effectively restrained by the slab. Design one of the intermediate beams using IS:800, 2007. Assume density of RCC & Floor finish as 25kN/m<sup>3</sup> and Live load as 3.5kN/m<sup>2</sup>. **07**

**OR**

- (b) (1) What are the reasons for riveting to become obsolete? **07**  
 (2) It is desirable to avoid connection failure before member failure, Justify.
- Q.3** (a) A suspension cable of 120m horizontal span is supported at the same level. It is subjected to a uniformly distributed load of 25kN/m (horizontal). If the maximum tension in the cable is limited to 4200kN, calculate the minimum central dip needed. **07**
- (b) Draw and explain the various components of a cable suspended bridge. **07**

**OR**

- Q.3** (a) Determine critical wind force (as per IS875-III) on each storey of a 3-D frame of a general building situated in Chennai having open terrain with well scattered obstructions having average height 8m. The building is on an upwind slope of hill. The actual horizontal length (L) of the upwind slope is 230m with slope  $\theta=11^\circ$ . The building is at a horizontal distance (X) of 120m from the crest of the hill. The size of the building is as follows: Assume normal permeability of the building for internal pressure coefficient. **07**
- 4-bays of 5.0 m in X-direction
  - 4-bays of 5.0m in Z-direction
  - 10 storey with 3.5m storey height
- (b) Explain the calculation of earthquake load for a multi storey building as per IS1893. **07**

- Q.4 (a)** Explain various structural connections with neat sketches: Beam to beam, beam to column and bracket connections. **07**
- (b)** Design a welded seat angle connection between a beam ISMB250 and flange of column ISHB300 for a reaction of beam 100kN, assuming Fe410 grade steel ( $f_y=250\text{Mpa}$ ) and field welding. **07**
- OR**
- Q.4 (a)** Design a bolted web cleat connection for an ISMB500 and a coped beam of size ISMB350 using bolts of 18mm diameter and grade 4.6. The factored load reaction is 200kN. **07**
- (b)** Design a bolted cover plate splice for an ISHB300 column connected to an ISHB300, to transfer axial load of 400kN. Both the columns are of grade Fe-410 steel. The ends are not machined for full contact in bearing. Draw detailed sketch of the connection. **07**
- Q.5 (a)** Determine the collapse load using plastic analysis for a frame ABCD for the following data:- 'AB' & 'CD' are vertical members with lengths 4m, A & D are the fixed supports. BC is a horizontal member with 6m length. The frame carries a horizontal rightward force 'W' at point B & a central vertical concentrated load 'W' on member BC. The frame has uniform plastic moment  $M_p$ . **07**
- (b)** What are the parameters which affect the strength of a column. Also explain possible failure modes of a column. **07**
- OR**
- Q.5 (a)** Draw & explain various parts of a Truss bridge. **04**
- (b)** A pratt truss girder through bridge is provided for single broad gauge track. The effective span of bridge is 21m (7panels @ 3m c/c) and height 5m. The stringers are spaced 2m between centerline. The main girders are provided at a spacing of 5m between their centerlines. **10**
- The total Dead load per girder=11kN/m, EUDLL (Equivalent Uniformly Distributed Live Load) for 21m span for each track=1649kN. Design critical top chord member OR Critical Bottom chord member for the data given above. Consider the impact factor as 0.57

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