Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – II • EXAMINATION – SUMMER • 2014

Subject code: 1722007 Date: 23-06-2014

Subject Name: Advanced Steel Structures

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.**

Q.1	Calculate design wind forces on a steel multi-storey building 60 m tall and plan size 15m x 30m to be constructed in Bombay. Assume average storey height to be 3.0m. The frames are to be spaced at 5m c/c in both directions.	**14**
Q.2		
a	Explain fatigue failure and fatigue resistance of steel structures. As per code which members should be checked for fatigue assessment.	**07**
b	Explain high-rise structural systems with neat sketches which can resist lateral loads and discuss various methods of approximate analysis for the same.	**07**
	OR	
b	Discuss about various loads to be taken for design of steel structures. Also discuss various load combination as per codal provisions and their importance.	**07**
Q.3		
a	Design a unstiffened seat connection for a factored load of 160 KN. The beam section ISMB450 at 72.4 Kg/m is connected to the flange of column ISMB500 of grade Fe 410 using bolted connection for grade 4.6	**07**
b	Design a web cleat connection between main beam ISMB500 at 869 N/mm and secondary beam ISLB350 at 495 N/mm. The secondary beam connected on one side of the web of the main beam has to transfer an end reaction of 130 KN due to factored loads. Use M20 bolts of grade 4.6 and Fe 410 steel. Draw a neat sketch of details of connections.	**07**
	OR	
a	Design a unstiffened seat connection for a factored load of 160 KN. The beam section ISMB450 at 72.4 Kg/m is connected to the flange of column ISMB500 of grade Fe 410 using welded connection.	**07**
b	A factored end reaction of 175 KN is transferred from a beam ISMB450 at 72.4 Kg/m to the column ISHB250 at 59.1 Kg/m. Design the framed connection when the fillet welds are applied directly on both the sides of the beam web.	**07**
Q.4		
a	A fixed based portal frame having bay width 5m and bay height 4m is subjected to Vertical UDL of 40 kN/m ↓ on beam and horizontal UDL of 30 kN/m → on left column. Using plastic approach design portal frame with Single section for beam and columns.	**07**
b	Determine the collapse load using plastic analysis for a frame ABCD for the following data:- 'AB' & 'CD' are vertical members with lengths 4m & 3m respectively, A & D are the fixed supports. BC is a horizontal member with 2 m 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**
	OR	
a	Calculate the moment carrying capacity of a laterally unrestrained ISMB450 member of length 4 m	**07**
b	A two span continuous beam ABC has span length AB= 6 m and BC= 4m, AB carries a factored udl of 20 kN/m completely covering the span AB & BC carries a pint load of 55 kN at its mid span. Support 'A' is fixed & 'C' is simple support. Find the section modulus required for 'I' section of the beam needed. Assume yield stress for the material as 250N/mm^2	**07**

Q.5

a Determine the maximum force developed in the cable supported 80m apart with supports having equal elevation. The central sag of cable is 0.5m. The cable is subjected load from deck of suspension bridge equal to 15 kN/m UDL. Also design the cable using standard grade of steel **07**

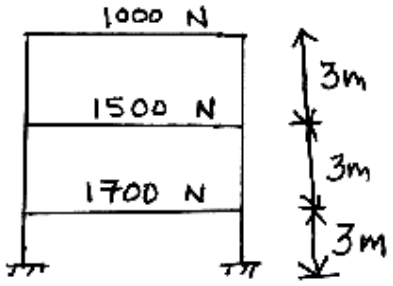
b In a plate girder of through type bridge, carrying a single broad guage track, the cross girders are provided at 3.5 m c/c. The stringers are placed at 2 m c/c. Using the data given below, design the stringers. **07**

Size of slipper = 2.8 m x 250 mm are provided 450 mm c/c.
The spacing between the main girder = 4 m.
Equivalent udl for 3.5 m for BM per track = 500 KN
Equivalent udl for 3.5 m for SM per track = 700 KN
The impact factor for 4 m span = 1.0. unit wt. of timber=7.5 KN per sq m

OR

a A suspension cable of 200m horizontal span and 15 m dip is supported at the same level. It is subjected to a uniformly distributed load of 15kN/m horizontal. Find the vertical and horizontal forces transmitted to the supporting pylons if a the cable is passed over a smooth pulley and b if the cable is clamped to a saddle with rollers on the top of the pier. **07**

b A three storey steel moment resisting frame as shown in figure is located in Ludhiyana Seismic Zone IV.The Soil conditions are soft and the damping is 5 %. Determine the seismic load as per IS1893-2002 on the frame. **07**



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