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Enrolment No.____

GUJARAT TECHNOLOGICAL UNIVERSITYME - SEMESTER- II (Old course)• REMEDIAL EXAMINATION – SUMMER 2015Subject Code: 1722007Date:15/05/2015Subject Name: Advance Steel StructuresTime:02:30 pm to 5:00 pmTotal Marks: 70Instructions:Total Marks: 70Attempt all questions.Make suitable assumptions wherever necessary.Figures to the right indicate full marks.Following IS codes and special publications are allowed.IS800: 2007 ii) IS875 (Part III) iii) IS1893 (Part I): 2002 iv) SP 1 and or Steel

Q.1 Determine critical wind force (as per IS875-III) on each storey of a 3-D frame of a (14) general building situated in Chennai having open terrain with well scattered obstructions having range of height between 1.5 to 10m. The building is on an upwind slope of hill. The actual horizontal length (L) of the upwind slope is 180m with slope =10°. The building is at a horizontal distance(X) of 85m from the crest of the hill. The size of the building is as follows: Assume normal permeability of the building for internal pressure coefficient.

(a)4-bays of 4.0 m in X-direction

(b)8-bays of 4.0m in Z-direction

(c)12 storey with 3.3m storey height.

- Q.2(a) Explain fatigue failure and fatigue resistance of steel structures. As per code which (07) members should be checked for fatigue assessment.
- Q.2(b) A beam ISLB400 at 569 N/mm is supported on a column ISHB250 at 547 N/mm at (07) each end. The beam has to transfer 100 KN load to the column. Design a web angle connection using M20 bolts of grade 4.6 and Fe 410 steel. Draw a neat sketch of details of connections.

OR

- Q.2(b) Design a web cleat connection between main beam ISMB500 at 869 N/mm and (07) 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 90 KN due to factored loads. Use M20 bolts of grade 4.6 and Fe 410 steel. Draw a neat sketch of details of connections.
- Q.3(a) A suspension cable of 140 m horizontal span is supported at the same level. It is (07) subjected to a udl of 30 KN/m. If the maximum tension in the cable is limited to 5000 kN, calculate the minimum central dip needed.
- Q.3(b) Discuss various loads to be taken for steel structures. Also discuss various load (07) combinations as per codal provisions and their importance.

OR

- Q.3(a) A suspension bridge is of 40 m span with a 3 m wide platform is subjected to a load (07) of 64 kN/m². The bridge is supported by a pair of cables having a central dip of 4.5 m. Find the cross sectional area of the cable necessary if the maximum permissible stress in the cable material is not to exceed 1.2x10⁵ KN/mm².
- Q.3(b) Discuss briefly about semi rigid and rigid connections.

(07)

- Q.4 Design a suitable beam-column assuming fy=250 N/mm² and effective length of (14) column as 0.8L along both the axes for
 - (i) a factored axial load = 600 kN
 - (ii) a factored bending moment =2000 kN m
 - (iii) a factored shear force = 800 kN.

OR

- Q.4 Design a continuous beam ABCD using plastic approach with following data (14)
 - (i) Span AB = 6m. Load= Two equidistant Point loads of 400kN.
 - (ii) Span BC = 7 m.Load= udl of 100 kN/m
 - (iii)Span CD= 8 m. Load= A single point load of 700 kN.

Take Dead load factor =1.7 and shape factor 1.12 for (i) provide uniform section throughout (ii) provide the most economical section. Support A is fixed and supports B,C and D are hinged.

- Q.5(a) Write a Short note on calculation of (a) Dead Load (b) Live Load (c) Wind Load and (07) (d) Earthquake Load as per Indian Standard Codes
- Q.5(b) A five storey one bay steel moment resisting frame having 3 m storey height is (07) located in Ludhiyana (Seismic Zone IV). The Soil conditions are medium and the damping is 5 %. Determine the seismic load as per IS1893-2002 on the frame. Take lumped mass on roof =2700 N and lumped mass on all other floors = 3500 N. This frame is to be used as hospital building with plan dimensions as 5mx 4m.

OR

Q.5 In a plate girder of through type bridge, carrying a single broad guage track, the (14) cross girders are provided at 4.0 m c/c. The stringers are placed at 2 m c/c. Using the data given below, design the stringers.

Size of slipper = 2.8 m x 250 mm x 250 mm are provided 450 mm c/c.

The spacing between the main girder = 4 m.

Equivalent udl for 4.0 m for BM per track = 500 KN

Equivalent udl for 4.0 m for SM per track = 600 KN

The impact factor for 4 m span = 1.0. unit wt. of timber= 7.5 KN/m^2 .