Seat No.: _____   *Enrolment No.*_____

GUJARAT TECHNOLOGICAL UNIVERSITY
PDDC - SEMESTER–VI • EXAMINATION – SUMMER • 2014

Subject Code: X 60604   **Date: 05-06-2014**

Subject Name: Structural Design-I

Time: 10:30 am - 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. **Use of IS: 800-2007 and STEEL TABLE is allowed.**

Q.1 Design a welded plate girder for a simply supported bridge deck beam with **14** clear span of 20 m to carry superimposed load 30 kN/m, without using bearing and intermediate stiffeners. Use mild steel with fy = 250 MPa.

Q.2 **(a)** What is limit state of serviceability? Discuss considerations taken by IS **07** 800:2007.

(b) Explain different methods for designing a plate girder as per IS 800:2007 **07** in detail.

<div align="center">OR</div>

(b) A portal frame consist two hinge supported column of 3.0 m length **07** separated by a beam of span 4 m and loaded up to collapse with downward uniformly distributed load of 20 kN/m and lateral load of 15 kN (From left). Find the plastic moment of resistance if it is of uniform strength.

Q.3 **(a)** Explain stress-strain curve for mild steel bar with figure. **07**

(b) List out various types of loads to be considered in design of steel structures **07** Also, explain effect of wind and earthquake loads.

<div align="center">OR</div>

Q.3 **(a)** Enlist advantages and disadvantages of plate girder against other structural **07** body.

(b) Design the stiffened seat connection for a beam ISMB 350 which transfers **07** a factored load of 200 kN to a column ISHB 300. Use Fe 410 grade steel.

Q.4 Show various types of truss components using figure. Also, determine the **14** design loads coming on the purlins of an industrial building near city Pune considering as general building with life of 50 years. A structure fall under terrain category 2 with maximum dimension of 40 m and width having 20 m. The height of eave level is 6 m with 13 m truss span.

Other data: Topography: $\Theta < 3°$, Spacing of trusses: 4.5 m, Permeability: Medium Sheeting; A.C. sheets, Spacing of purlins: 1.35 m, Pitch: 1/4

<div align="center">OR</div>

Q.4 **(a)** A continuous steel beam consists of three equal spans 8 m each carrying an **07** udl of 45 kN/m under working conditions. Determine fully plastic moment required for the beam.

(b) Explain phenomena of occurring plastic hinge. Also, show the important locations **07** (using appropriate figure) where it occurs.

Q.5 Design a simply supported gantry girder to carry one electric overhead **14** travelling crane. Considering following data:

Span of gantry girder = 5.5 m

Span of crane girder = 10 m

Crane capacity = 20 kN

Self-weight of crane girder excluding trolley = 125 kN

Self-weight of trolley = 30 kN

Minimum hook approach = 1.1 m

Distance between wheels = 3.0 m

Self-weight of rails = 0.22 kN/m

Only do the check for buckling resistance.

OR

Q.5 Design a pedestrian foot bridge of N- Type lattice girder considering 8 no. of **14** panels and laterally supported by rakers. Consider bridge span of 16 m and width of walk way is 2.0 m. Flooring made up with RCC slab of 100 mm depth considering floor finish and live load is 1.3 kN/m^2 and 3.0 kN/m^2 respectively.

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