Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – WINTER • 2013

Subject code: 712005N Date: 30-12-2013

Subject Name: Basic Concepts of Structural Behaviour

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.**

Q.1 **(a)** Draw neat diagram of various Primary Structural units and their aggregation, explain the load transfer in the structural components. **07**

(b) What is the importance of analysis of structures? Which different types of loads considered for analysis and design of a general structure? **07**

Q.2 **(a)** Explain the following: **07**

- Resultant of a force system & Equilibrant of a force system.
- Free-body diagram
- Arch and cable structures.

(b) What are the methods for analysis of truss? Explain with neat sketch. Explain the concept of stable, perfect and imperfect truss. **07**

OR

(b) Draw conceptual shear force and bending moment diagrams for the following beams. **07**

- Simply supported beam with udl on entire span.
- Cantilever beam with udl on whole length and a concentrated load at mid length of cantilever.
- A symmetrical double overhanging beam with udl over entire length of the beam.

Q.3 **(a)** Explain structural phenomena and general design responses for different types of failure: overturning, sliding, lateral racking, twisting, and member failure with neat sketches. **07**

(b) A three hinged symmetrical arch with two hinges at two supports & third hinge at centre of span 60m and rise 12m, carries concentrated loads of 200kN and 350 kN at distances of 10m and 20m from right hand end and an udl of 30kN/m on the left half of the span. Determine the horizontal thrust. Find out bending moment at a point on arch which is at a horizontal distance of 15m from left support. **07**

OR

Q.3 **(a)** Why strong column weak beam philosophy is used for design purpose? What is the importance of end conditions in design of a column? Explain design steps for a column. **07**

(b) A suspension cable of 120m horizontal span is supported at the same level. It is subjected to a udl of 25kN per horizontal metre. If the maximum tension in the cable is limited to 4500kN, calculate the minimum central dip needed. **07**

Q.4 **(a)** Determine the member forces in the truss shown in fig.1, using a joint **07**

equilibrium approach.

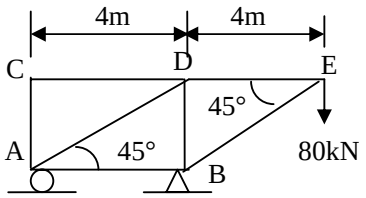

Fig.1

(b) An overhanging beam of 12m length has two supports, one at one end of the beam & the other at 10m from first support. The beam carries udl of 10kN/m over entire length of 12 m and a concentrated load of 20kN at free end of the overhang. Determine the support reactions. **07**

OR

Q.4 (a) Draw bending stress and shearing stress distribution diagrams for circular, Tee and 'I' sections. **07**

Q.4 (b) Determine the reactions for the beam B1 in the floor framing system as shown in fig.2. Assume Dead-Load of the Floor = 3kN/m^2 & Live-Load = 2.5kN/m^2. Assume self weight of B2=1kN/m. **07**

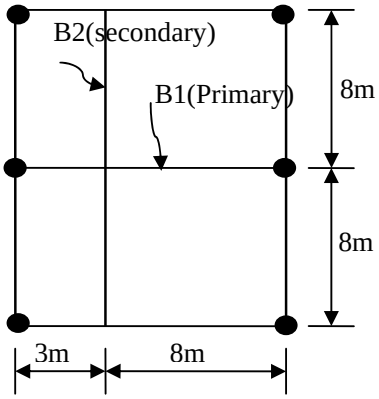

Fig.2

Q.5 (a) Explain giving appropriate examples and importance: **07**

- Resolution and composition of force
- Ductile and brittle behaviour

(b) Give brief note on the following: **07**

1. Finite Element Analysis
2. Stresses and strains.

OR

Q.5 (a) (1) Explain General Principles of Grid and plate structures. **07**
(2) Explain various cable systems and their uses.

(b) Classify structures based on: Geometry and materials. **07**

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