

GUJARAT TECHNOLOGICAL UNIVERSITY**M.E Sem-I Regular Examination January / February 2011****Subject code: 712005N****Subject Name: Basic Concepts of Structural Behaviour****Date: 04 /02 /2011****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** (a) Classify various types of structures based on their Geometry with neat sketches. **07**
 (b) A cantilever beam that is of T-section and length 2.5m carries a uniformly distributed load of 10kN/m. Determine the shear stress distribution across the section at the point of maximum shear force present in the member. Assume that the dimensions of the beam are as follows. Flange:- 300mm wide and 20mm thick, Web:-20mm wide and 250mm deep. Draw the shear stress distribution diagram across the section of the beam. **07**
- Q.2** (a) Explain concepts of forces, moments, equilibrium and free-body diagrams. **07**
 (b) What is 'Shear Center'? Explain the importance of the Shear Center. **07**
- OR**
- (b) Explain general design principles for Design of Beams. **07**
- Q.3** (a) Explain behaviour of structural members in Tension, compression, bending, shear, torsion and bearing with neat sketches. **07**
 (b) A three hinged symmetrical arch with two hinges at two supports & third hinge at centre of span 50m and rise 10m, carries concentrated loads of 150kN and 300 kN at distances of 10m and 18m from left end and an udl of 50kN/m on the right half of the span. Determine the horizontal thrust. Find out bending moment, normal thrust and radial shear at a point on arch which is at a horizontal distance of 15m from left support. **07**
- OR**
- Q.3** (a) A cable of horizontal span 25m is to be used to support four equal loads of 50kN each at 5m spacing. The central dip of the cable is limited to 3m. Find the length of the cable required and also its sectional area if the safe tensile stress is 650N/mm^2 . **07**
 (b) Give general objectives for Design of PLATE, GRID and SPACE-FRAME Structures. **07**
- Q.4** (a) Determine the member forces in the truss shown in fig.1, using a joint equilibrium approach. **07**

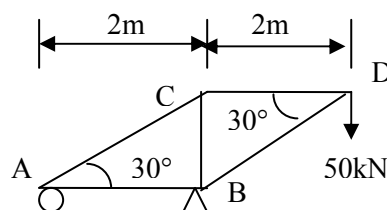


Fig.1

- (b) State and explain various types of loads which are to be considered for Analysis and Design of structures in general. 07

OR

- Q.4 (a) Explain modeling of structures and the external loads for general analysis. 07
- (b) Determine the reactions for a typical interior joist in the floor framing system that supports a partition wall as shown in fig.2. Assume partition 2m high 100mm thick of 20kN/m^3 density. Assume Dead-Load of the Floor= 2.5kN/m^2 & Live-Load= 3.5kN/m^2 . 07

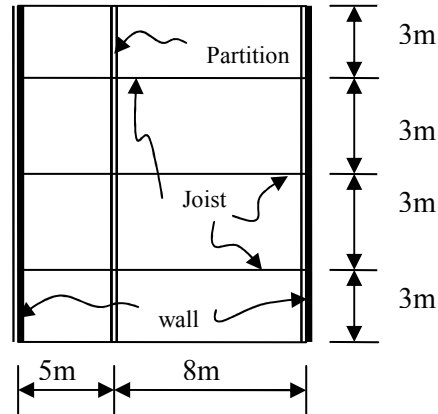


Fig.2

- Q.5 (a) (1) Explain General Principles of Funicular shapes and draw various types of Funicular structures. 07
- (2) Explain various double-cable systems and their uses.
- (b) Give brief note on the following: 07
1. Principal stresses
 2. Finite Element Analysis

OR

- Q.5 (a) Draw shearing stress and bending stress distribution for Rectangular, Tee and 'I' sections. 07
- (b) A simply supported beam spans 8m carries a uniform loading of $w=5\text{kN/m}$. The maximum bending moment occurs at mid span. Two beams of equal cross-sectional area but different shapes (1-Rectangular $B=80\text{mm}$, $D=150\text{mm}$ and 2-Circular of diameter 123.6mm) are considered for use. In which beam are the maximum bending stresses the lowest? 07
