

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**BE- SEMESTER 1<sup>st</sup> / 2<sup>nd</sup> EXAMINATION (OLD SYLLABUS) – SUMMER - 2017**

**Subject Code: 110010****Date: 09/06/2017****Subject Name: Mechanics of Solids****Time: 2:30 PM to 05:00 PM****Total Marks: 70****Instructions:**

1. Attempt any five questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) State and explain the Law of parallelogram of forces and the Lami's theorem. **07**  
(b) The following forces are acting at a point; find the magnitude and direction of the resultant force. **07**
1. 750kN acting towards North.
  2. 1000kN acting towards South-West
  3. 800kN acting 30° South of East
  4. 250kN acting towards East.
- Q.2** (a) 1. Classify the trusses from the analysis point of view. **07**  
2. Explain various types of supports and corresponding reactions.  
(b) Find the forces in any five members of the truss loaded as shown in the Fig.1 **07**
- Q.3** (a) Determine Centroid of the plane area as shown in Fig.2. **07**  
(b) Calculate the moment of inertia of the plane area shown in Fig.2 with respect to the axis passing through the base 'AB'. **07**
- Q.4** (a) Draw shear force and bending moment diagrams for the beam loaded as shown in Fig.3. Also locate the point of contraflexure. **07**  
(b) A uniform ladder, 1000N weight and 9m long, rests on rough floor and leans against a smooth vertical wall. Ladder makes 45° with the floor. The coefficient of friction between the ladder and the floor is 0.5. Determine how high along the ladder a man, having 500N weight will be able to ascend, before the ladder slips. Also define: Angle of repose and angle friction. **07**
- Q.5** (a) Define: Stress, Strain, Modulus of Elasticity, Hooke's law, Poisson's ratio, ductility and hardness **07**  
(b) Find unknown force 'P' for equilibrium and also determine the stress and deformation in each part of the rod ABCD shown in Fig.4. Take  $E=2 \times 10^5$  N/mm<sup>2</sup>. **07**
- Q.6** (a) State assumptions for the theory of pure bending and give the expression of bending formula explaining the terms involved. **07**  
(b) Find out uniformly distributed load which can be safely applied to a cantilever beam having span 2m. The beam has rectangular cross section 200mmX300mm. The allowable bending stress in beam material is 15N/mm<sup>2</sup>. **07**
- Q.7** (a) Draw neat sketches of shear stress distribution for the following sections: T-section, I-section and hollow rectangular section **07**

- (b) A point in a strained material is subjected to a tensile stress of  $150\text{N/mm}^2$  and a compressive stress of  $80\text{N/mm}^2$  acting at right angles to each other. Determine the Normal, tangential and resultant stress on a plane inclined at  $30^\circ$  in anticlockwise direction with the direction of compressive stress. **07**

**Figures**

