Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE- SEMESTER 1st / 2nd 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 parallellogram 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. 2. Explain various types of supports and corresponding reactions.	**07**
	(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^2.	**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^2.	**07**

Q.7	**(a)**	Draw neat sketches of shear stress distribution for the following sections: T-section, I-section and hollow rectangular section	**07**

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

Figures

Fig.1

Fig.2

Fig.3

AB; length=500mm,dia=10mm, BC; length=800mm,dia=20mm
CD; length=750mm,dia=8mm

Fig.4

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