Seat No.: _____ **Enrollment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– 1st / 2nd EXAMINATION– SUMMER 2016

Subject Code: ENG004 **Date:10/06/2016**

Subject Name: Mechanics of Solids

Time:02:30 PM to 5:00 PM **Total Marks: 70**

Instructions:

1. **Attempt any five questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Draw neat and clean figure with pencil only.**

Q.1	**(a)**	State and prove parallel axes theorem. Find moment of inertia of square section using this principle.	**07**
	(b)	Determine the support reactions of a cantilever beam having length 'L' subjected to point load 'W' at tip and 'W/2' at the center of a beam.	**07**
Q.2	**(a)**	Draw bending moment diagram and shear force diagram for a simply supported beam of length 'L', subjected to udl of 'w' kN/m throughout the length and 'W' at the center of a beam.	**07**
	(b)	Derive the relation between shear force and bending moment.	**07**
Q.3	**(a)**	Explain (i) Lami's theorem (ii) law of transmissibility (iii) Varignon's theorem.	**07**
	(b)	Explain the equilibrium conditions for coplanar concurrent and coplanar non concurrent force system.	**07**
Q.4	**(a)**	Define: (i) Vector and scalar quantities (ii) Resolution of force (iii) Couple	**07**
	(b)	Explain Law of parallelogram and triangle law of forces.	**07**
Q.5	**(a)**	A rod of length 1.2 m and diameter 22 mm is subjected to tensile load of 25 kN. The increase in length of rod is 0.42 mm and decrease in diameter is 0.0019 mm. Calculate the Poisson's ratio and Modulus of Elasticity.	**07**
	(b)	Define: Modulus of rigidity, Bulk Modulus and Volumetric strain.	**07**
Q.6	**(a)**	Prove Izz = Ixx + Iyy.	**07**
	(b)	For a given machine it was found that an effort had to be moved through a distance of 400 mm to move the load by 10 mm. Using this machine a load of 50 kN was raised by an effort of 1.5 kN. Determine (i) velocity ratio of the machine (ii) Mechanical advantage (iii) efficiency.	**07**
Q.7	**(a)**	A rod of diameter 12 mm and length 2.2 m is heated from 42° C to 105° C. Find (I) change in length when freely expanded (II) stress, when completely restrained. Take E= $2x10^5$ N/mm^2 and $\alpha = 12x10^{-6}$ /° C.	**07**
	(b)	Explain the law of static friction. Also explain the terms: Angle of repose and angle of friction,	**07**

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