Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–1st / 2nd (SPFU) EXAMINATION– WINTER 2015

Subject Code: ENG004 **Date:05/01/2016**

Subject Name: Mechanics of Solids

Time: 10:30am to 01:00pm **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)**	Define: (i) Vector quantities (ii) Resolution of force (iii) Couple	**07**
	(b)	State law of parallelogram. Determine the magnitude and direction of resultant of the force system shown in Fig. 1.	**07**
Q.2	**(a)**	State: (i) Lami's theorem (ii) law of transmissibility (iii) Varignon's theorem .	**07**
	(b)	Find the unknown weight 'W' in a given force system shown in Fig. 2.	**07**
Q.3	**(a)**	Determine the centroid of the lamina shown in Fig. 3.	**07**
	(b)	State and prove parallel axes theorem. Find moment of inertia of rectangular section using first principle.	**07**
Q.4	**(a)**	Determine the support reactions for the beam shown in Fig. 4.	**07**
	(b)	Define: Point of zero shear. Draw shear force and bending moment diagrams for the beam shown in Fig. 5	**07**
Q.5	**(a)**	For a bar shown in Fig 6. Find unknown force 'P', stresses in each part and total deformation. Cross-section areas AB= 500 mm^2, BC= 600 mm^2, CD = 500 mm^2. E= 2x 10^5 N/mm^2	**07**
	(b)	A rod of length 1m and diameter 20mm is subjected to tensile load of 20kN. The increase in length of rod is 0.3mm and decrease in diameter is 0.0018mm. Calculate the Poisson's ratio and Modulus of Elasticity.	**07**
Q.6	**(a)**	In a machine it was found that an effort had to be moved through a distance of 350 mm to move the load by 7mm. Using this machine a load of 48,000 N was raised by an effort of 1200 N. Determine (i) velocity ratio of the machine (ii) Mechanical advantage (iii) efficiency (iv) Load can be lifted with 1200 N effort under ideal condition.	**07**
	(b)	Define: (i) Modulus of Elasticity (ii) Lateral strain (iii) Poisson's ratio	**07**
Q.7	**(a)**	(a) Define : Angle of Repose (b) State and explain the Laws of Static friction.	**07**
	(b)	A rod of diameter 10 mm and length 2 m is heated from 40° C to 100° C. Find (i) change in length when freely expanded (ii) stress, when completely restrained. Take E= 2x10^5 N/mm^2 and α = 12x10^{-6} /° C	**07**

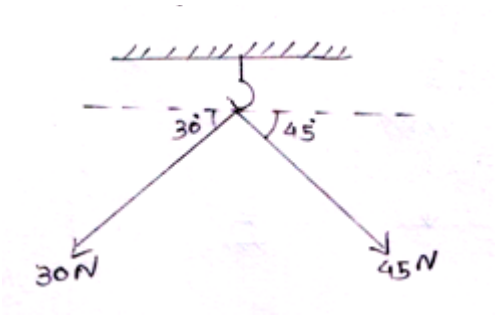

Fig.1

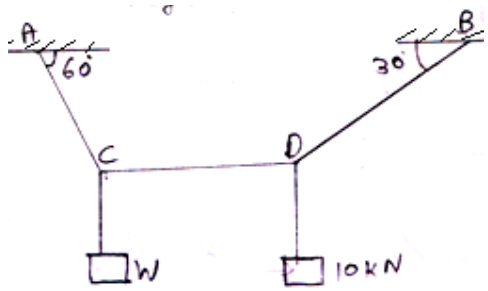

Fig.2

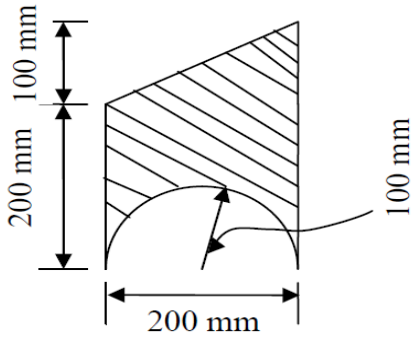

Fig.3

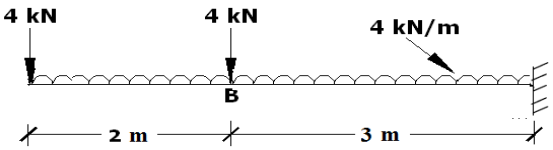

Fig.4

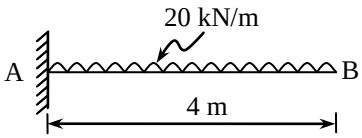

Fig. 5

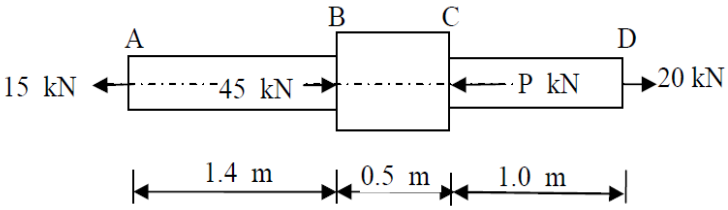

Fig.6