Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE/PDDC- SEMESTER– 1st / 2nd • EXAMINATION – WINTER 2018

Subject Code:ENG004 **Date: 04/01/2019**

Subject Name: Mechanics of solids

Time: 2:30 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.**

Q.1	**(a)**	A system of four forces shown in **Fig. 1**, has resultant 50 kN along + X – axis. Determine magnitude and inclination of unknown force P.	**07**
	(b)	Determine magnitude, direction and perpendicular distance from 'O', of the resultant for the force system shown in **Fig.2.**	**07**
Q.2	**(a)**	A cord supported at A and B carries a load of 20kN at D and a load of W at C as shown in **Fig.3**. Find the value of W so that CD remains horizontal.	**07**
	(b)	Define force, Discuss its characteristics and explain different all type of force system with figures.	**07**
Q.3	**(a)**	A ladder 5 m long, rests on horizontal ground and leans against a smooth vertical wall making an angle of 30° with the wall. Its weight is 1500 N and it is on the point of sliding when a man weighing 600 N stands on it at a distance of 2.1 m from the foot of the ladder. Calculate the coefficient of friction.	**07**
	(b)	Find the Moment of Inertia of a rectangular area about its centroidal x and y axis using the Parallel axis theorem.	**07**
Q.4	**(a)**	Find the total deformation of a steel rod subjected to a force of 250kN, as shown in **Fig.4.** Length of rod is 1000mm and Modulus of Elasticity of steel is 200GPa.	**07**
	(b)	A wire is tied straight between two rigid poles 10 m apart has initial tensile stress 10 N/mm² at 32° C. Calculate stress in wire if temperature reduces to minus 8° C. Take E = 75 x 105 N/mm² and α = 20 x 10 -6 / °C.	**07**
Q.5	**(a)**	Determine the Stress, Strain, Modulus of Elasticity and Poisson's Ratio from the following results for a bar tested on UTM: Diameter = 20mm; Gauge length = 150 mm; Increase in Gauge length = 14mm; Decrease in diameter = 0.85 mm; Tensile load = 6 kN.	**07**
	(b)	Define: Equilibrant, Centroid, Strength, Poisson's ratio, Modulus of rigidity, Bulk Modulus and Volumetric strain.	**07**
Q.6	**(a)**	Calculate shear force, bending moment and axial thrust at points A, B, C and D for the beam shown **Fig.5** Also plot neat shear force, bending moment and axial thrust diagrams indicating values at above points.	**07**
	(b)	For coplanar force system prove that "The algebraic sum of the moments of all the forces about any point is equal to the moment of their resultant force about the same point ".	**07**

Q.7 (a) Derive the relation between SF and BM in a beam subjected to general loading. **07**

(b) Derive relationship between modulus of elasticity, modulus of rigidity and Poisson's ratio. **07**

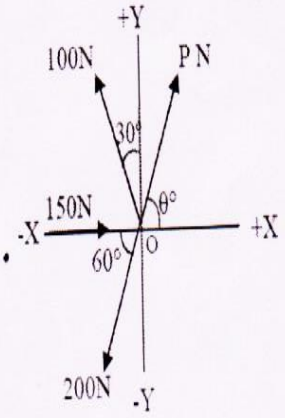

Fig. 01

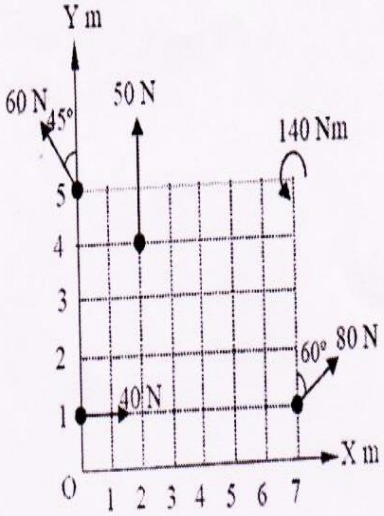

Fig. 02

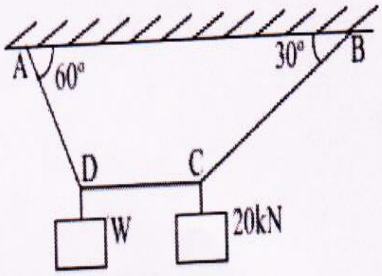

Fig. 03

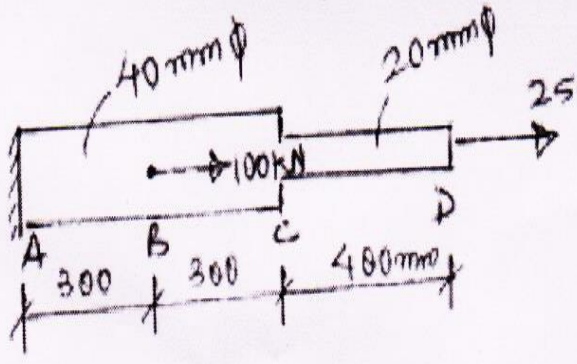

Fig. 04

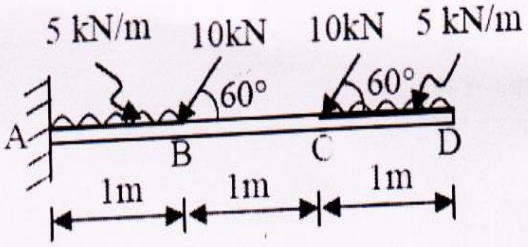

Fig. 05

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