Register Number:……..

KUMARAGURU
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B.E/B.TECH DEGREE EXAMINATIONS: NOV/DEC 2022

(Regulation 2018)

Third Semester

MECHANICAL ENGINEERING

U18MET3002 - Engineering Mechanics

COURSE OUTCOMES

CO1: Apply the fundamental concepts in determining the effect of forces on a particle.
CO2: Make use of various principles in the determination of effect of forces in a rigid body.
CO3: Determine the geometry dependent properties of solids and sections.
CO4: Solve problems in static friction.
CO5: Identify motion and determine the velocity and acceleration of a particle.
CO6: Apply the principles of kinetics in solving problems in dynamics.

Time: Three Hours **Maximum Marks: 100**

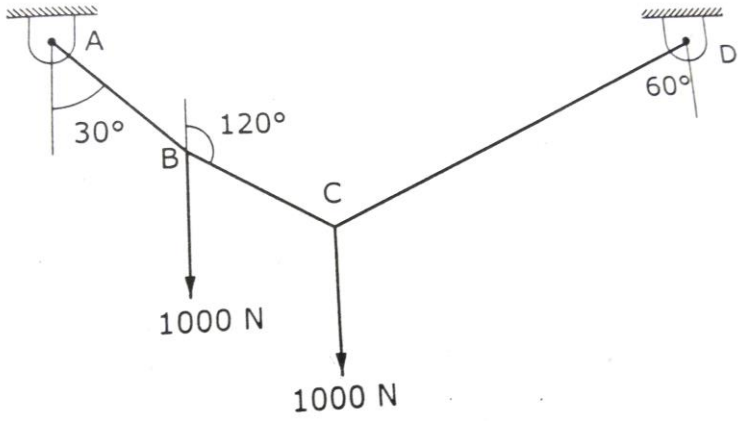
Answer all the Questions:-
PART A (10 x 2 = 20 Marks)
(Answer not more than 40 words)

1.	Define resolutions of a force.	CO1	[K_1]
2.	Infer free body diagram.	CO1	[K_2]
3.	Compare moment and couple.	CO2	[K_2]
4.	Contrast center of gravity and centroid.	CO2	[K_2]
5.	Compare the types of supports of a beam.	CO3	[K_2]
6.	Outline pappus and guldinus theorems.	CO3	[K_2]
7.	Define co-efficient of friction and angle of friction.	CO4	[K_2]
8.	Define impending motion.	CO4	[K_1]
9.	State D' Alembert's principle.	CO5	[K_1]
10.	Summarize kinematics and kinetics	CO6	[K_2]

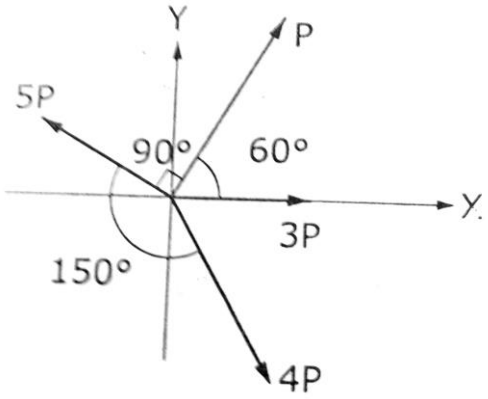
Answer any FIVE Questions:-
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

11.	a)	Find the magnitude of the two forces, such that if they act at right angles, their resultant is $\sqrt{10}$N. But if they act at 60º, their resultant is $\sqrt{13}$N.	6	CO1	[K_1]
	b)	A string ABCD, attached to two fixed points A and D has two equal weights of 1000N attached to it at B and C. The weights rest with the portions AB and CD inclined at angles of 30º and 60ºrespectively, to the vertical as shown in fig.	10	CO1	[K_2]

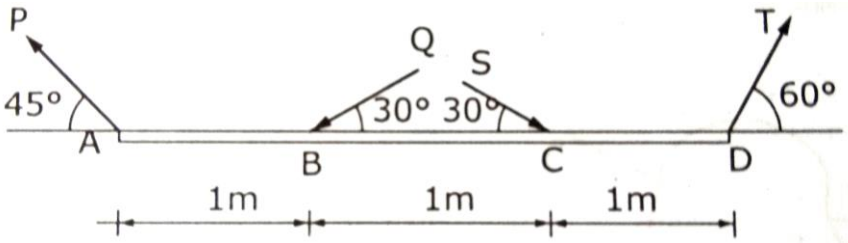
Find the tensions in the portions AB, BC and CD of the string, if the inclination of the portion BC with the vertical is 120^o



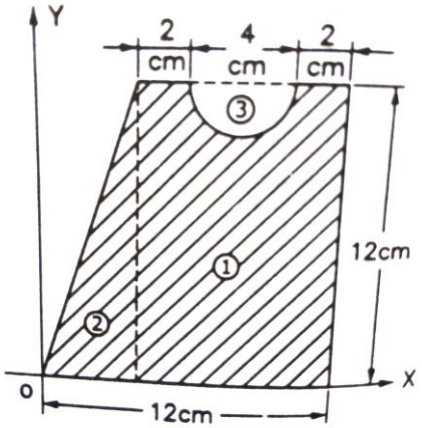
12. a) Find the magnitude and direction of the resultant 'R' of four concurrent forces acting as shown in fig. 8 CO2 [K_1]



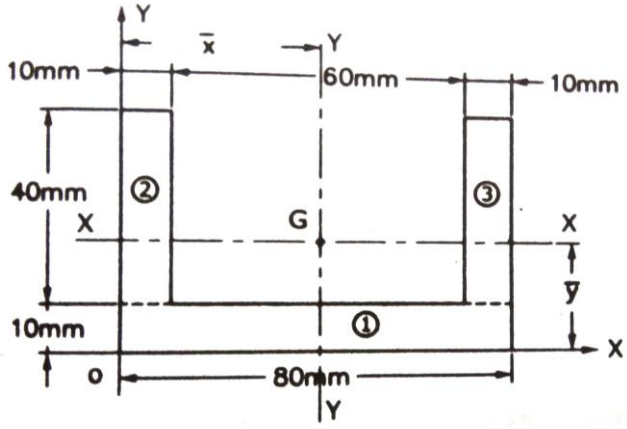
b) ABCD is a weightless rod under the action of four forces P, Q, S and T as shown in fig. If P = 10N, Q = 4N, S = 8N and T = 12N, calculate the resultant and mark the same in direction with respect to the end A of the rod. 8 CO2 [K_2]



13. a) Find the moment of inertia of plane area shown below in fig. about its centroidal axes. 8 CO3 [K_1]

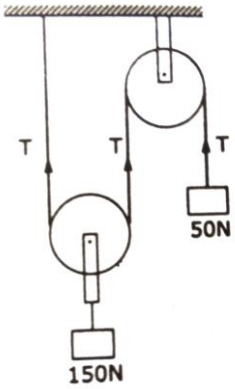


b) Find the moment of inertia of the section shown below in fig. 8 CO3 [K_2]



14. a) A uniform ladder of weight 1000N and of length 4m rests on a horizontal ground and leans against a smooth vertical wall. The ladder makes an angle of 60° with horizontal. When a man of weight 750N stands on the ladder at a distance 3m from the top of the ladder, the ladder is at the point of sliding. Determine the co-efficient of friction between the ladder and the floor. 8 CO4 [K_2]

b) A block overlying a 10° wedge on a horizontal floor and leaning against a vertical wall and weighing 1500 N is to be raised by applying a horizontal force to the wedge. Assuming co-efficient of friction between all the surfaces in contact to be 0.3. Determine the minimum horizontal force to be applied to raise the block. 8 CO4 [K_2]

15.	a)	An airplane is flying on a straight level course at 200 km/hr at a height of 1000 meter above the ground. An anticraft gun located on the ground fires a shell with an initial velocity of 300 m/s, at the instant when the plane is vertically above it. At what inclination, to the horizontal, should the gun be fired to hit the plane? What time after firing, the gun shell will hit the plane? What will then be the horizontal distance of the plane from the gun?	8	CO5	[K_2]
	b)	Two blocks of weight 150 N and 50 N are connected by a string and passing over a frictionless pulley as shown in fig. Determine the acceleration of blocks A and B and the tension in the string. 	8	CO5	[K_2]
16.	a)	A spring of stiffness 0.5 N/mm is placed, horizontally and a ball of mass 5 kg strikes the spring horizontally with a velocity equal to that attained by a vertical fall of height 120mm. Find the maximum compression of the spring using law of conservation of Mechanical energy.	8	CO6	[K_2]
	b)	A ball is dropped from a height of 10m on a fixed steel platform. Determine the height to which the ball rebounds on the first, second and third bounces. The co-efficient of restitution between the ball and the plate is 0.9.	8	CO6	[K_2]

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