Register No.: …… Name: ……

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

SECOND SEMESTER B.TECH DEGREE EXAMINATION (Special), AUGUST 2021

Course Code: **20EST100**

Course Name: **Engineering Mechanics**

Max. Marks: **100** **Duration: 3 Hours**

PART A

(Answer all questions. Each question carries 3 marks)

		CO
1.	Explain the Principle of transmissibility with an example.	[1]
2.	The greatest and least resultants of two forces F_1 and F_2 are 17N and 3N respectively. Determine the angle between them when their resultant is √149.	[2]
3.	Distinguish static friction and dynamic friction.	[1]
4.	A 5m long beam simply supported at the ends is acted upon by the point loads 5kN and 2 kN at 1m and 3m respectively from left support. Find the reactions at the support.	[3]
5.	State Parallel axis theorem and Perpendicular axis theorem.	[1]
6.	State the theorems of Pappus Guldinus.	[1]
7.	A block weighing 1000N rests on a horizontal plane. Find the magnitude of horizontal force required to give the block an acceleration of 2.5m/s^2 towards the right using D' Alembert's principle. Given co-efficient of friction between block and plane is 0.25.	[4]
8.	The displacement of a particle is given by $S=t^3-3t^2+2t+5$.Find the time at which the acceleration is zero and the time at which the velocity is 2 m/s.	[4]
9.	A body moving with SHM has velocities of 12m/s and 6m/s at 2m and 4m distance from the mean position. Find the amplitude of the body.	[5]
10.	Distinguish between damped and undamped free vibration.	[5]

PART B

(Answer one full question from each module, each question carries 14 marks)

MODULE I

			CO	Marks
11.	a)	Explain the concept of free body diagram with an example.	[1]	(4)
	b)	Two cylinders of weight 250 N and 500N with radius of 1m and 2m rests in a horizontal channel having vertical walls and base width 5m as shown in **Fig 1**. Find the reactions at A, C and D.	[2]	(10)

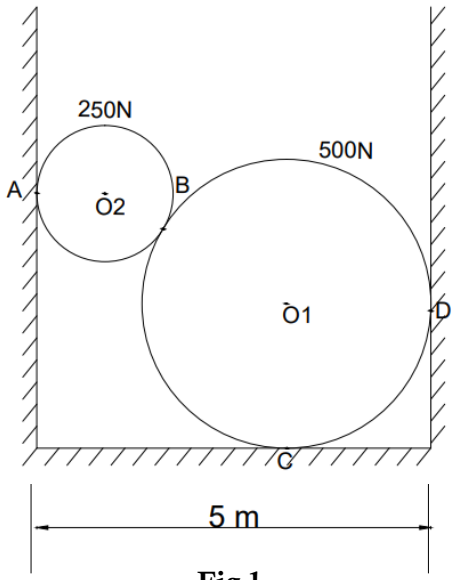

Fig 1

OR

			CO	Marks
12.	a)	What are the fundamental Principles of Mechanics? State and explain each of them.	[1]	(4)
	b)	Determine the magnitude and direction of the resultant of the forces acting on a ring as shown in Fig 2.	[3]	(10)

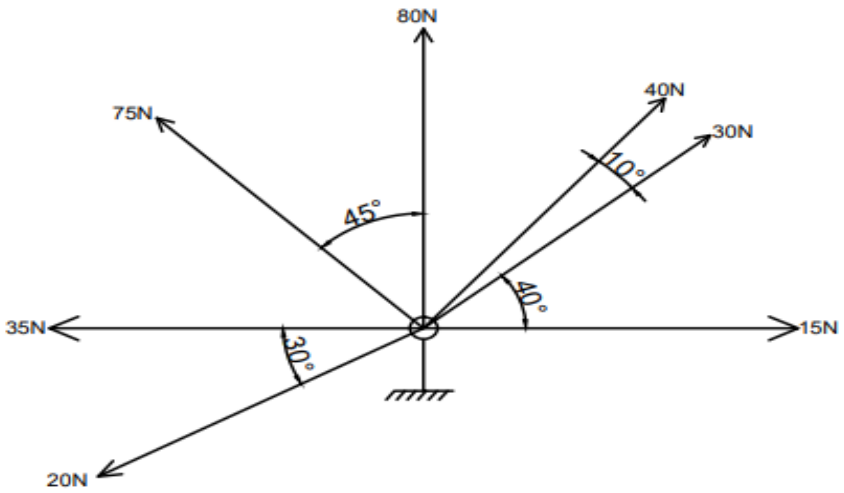

Fig 2

MODULE II

			CO	Marks
13.	a)	Discuss briefly about different types of supports and beams.	[1]	(4)
	b)	A uniform ladder of weight 850N and of length 6m rests on a horizontal ground and leans against a smooth vertical wall. The angle made by the ladder with the horizontal is 65°. When a man of weight 750N stands on the ladder at a distance 4m from the top of	[3]	(10)

the ladder, it is at the point of sliding. Determine the co-efficient of friction between floor and ladder.

OR

			CO	Marks
14.	a)	Define angle of friction and angle of repose. Prove that angle of repose is equal to angle of friction.	[1]	(4)
	b)	Find the reactions at the support of the beam given in fig 3.	[3]	(10)

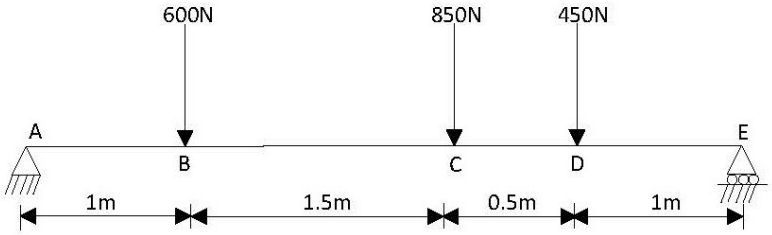

Fig 3

MODULE III

			CO	Marks
15.	a)	Explain moment of inertia and polar moment of inertia.	[1]	(4)
	b)	Calculate the centeroid of the composite figure shown in fig 4.	[4]	(10)

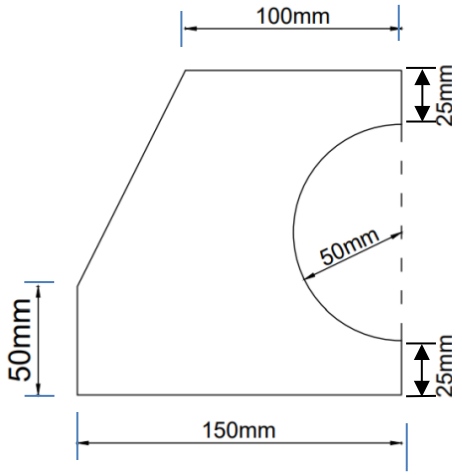

Fig 4

OR

			CO	Marks
16.	a)	A force of magnitude 200N is acting along the line joining P(2,4,6) and Q(4,7,10). Find the moment of the force about R (7,10,15)	[4]	[4]
	b)	Find the moment of inertia of a plate with a circular hole about its centeroidal X-axis as shown in fig 5.	[4]	(10)

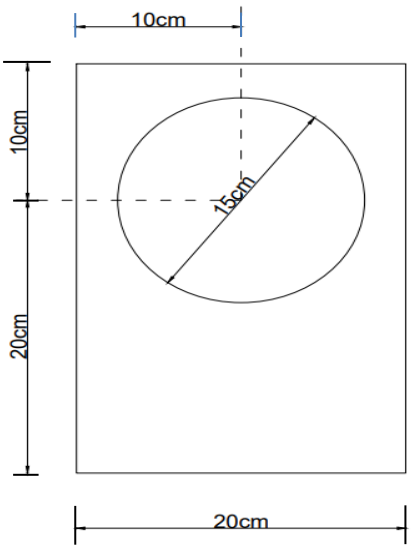

fig .5

MODULE IV

			CO	Marks
17.	a)	State D'Alembert's principle.	[1]	(3)
	b)	Two rough planes inclined at 30° and 60° to the horizontal and the same height are placed back to back as shown in fig 6. Masses of 15kg and 30kg are placed on the faces and are connected by a string passing over the pulley on the top of the plane as shown in fig. Given μ=0.6 for both the surfaces. Determine the resulting acceleration and tension in the string.	[4]	(11)

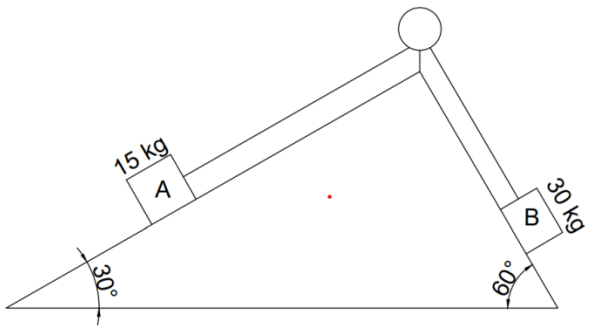

fig .6

OR

			CO	Marks
18.	a)	Differentiate between rectilinear motion and curvilinear motion.	[4]	(3)
	b)	A projectile fired from the edge of a150m vertical cliff with an initial velocity of 180m/s at an angle of elevation 30° with the horizontal. Neglecting air resistance, find		
		i) The greatest elevation above the ground reached by the projectile.	[4]	(11)
		ii) Horizontal distance from the gun to the point ,where the projectile strikes the ground.		

MODULE V

			CO	Marks
19.	a)	Explain the instantaneous centre of rotation.	[5]	(4)
	b)	A wheel rotates for 5 sec with a constant angular acceleration and describes during that time 100 radian. It then rotates with constant angular velocity and during the next 5 seconds, describes 80 radian. Determine initial angular velocity and angular acceleration.	[5]	(10)

OR

			CO	Marks
20.	a)	Determine the weight, which is to be connected to a spring of stiffness 5 N/cm, so that the weight is oscillating with a time period of 1 sec.	[5]	(4)
	b)	The frequency of free vibrations of weight, W with a stiffness, K is 12 cycles per second. When an extra weight of 20N is coupled with weight the frequency reduces to 10 cycles per second. Find the weight, W and stiffness, K of the spring.	[5]	(10)

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