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Name:_

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S1 (S, FE) S2 (S, FE) Examination December 2024 (2019 Scheme)

Course Code: EST 100 Course Name: ENGINEERING MECHANICS (2019 -Scheme)

Max. Marks: 100

Duration: 3 Hours

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	PART A	
	Answer all questions, each carries 3 marks	Marks
1	State the Principle of transmissibility of forces. What is its limitation?	(3)
2	Explain the conditions of equilibrium of two force and three force system.	(3)
3	Show that angle of repose is equal to angle of friction.	(3)
4	What is couple? List its characteristics.	(3)
5	State and prove Perpendicular axis theorem.	(3)
6	Derive the expression for Mass moment of inertia of a thin circular disc.	(3)
7	A body of mass 50 kg slides down a rough inclined plane whose inclination to	(3)
	the horizontal is 30° . If the coefficient of friction between the plane and the body	
	is 0.4, determine the acceleration of the body.	
8	State and Explain D'Alembert's Principle.	(3)
9	Explain about Instantaneous centre of rotation.	(3)
10	A 80 N weight is hung on the end of a helical spring and is set vibrating vertically. The weight makes 4 oscillations per second. Determine the stiffness of the spring.	(3)
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PART B

Answer one full question from each module, each question carries 14 marks. MODULE 1

11 a Find the resultant of forces as shown in figure



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b Two cables AC and BC are tied together at the point C to support a load of 500 N (8) at C. A and B are at a distance of 1.3 m and are on the same horizontal plane. AC and BC are 1.2 m and 0.5 m respectively. Find the tensions in AC and BC

Two identical smooth rollers each weighing 400 N are supported by an inclined (14) plane at 30° to the horizontal and a wall at right angle to the inclined plane. Find the reactions at the supports A, B and C.



MODULE 2

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Two blocks A and B, weighing 500N & 1000N respectively, are resting against a (14) wall and a floor as shown in fig. Find the value of horizontal force P applied to the lower block for which the system remains in equilibrium. Coefficient of friction is 0.25 at the floor and 0.3 at the wall and 0.2 between the blocks.



- 14 a A uniform ladder of length 13 m and weighing 25 N is placed against a smooth (9) vertical wall with its lower end 5 m from the wall. The coefficient of friction between the ladder and floor is 0.3. What is the frictional force acting on the ladder at the point of contact between the ladder and the floor? Show that the ladder will remain in equilibrium in this position.
 - b Two unlike parallel forces are acting at a distance of 450 mm from each other. (5)
 The forces are equivalent to a single force of 900 N, which acts at a distance of
 200 mm from the greater of the two forces. Find the magnitude of the forces.

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MODULE 3

15 Find the moment of inertia of the composite section as shown in figure about its (14) horizontal centroidal axis.



16 Three forces 500 N, 700 N and 800 N are acting along the three diagonals of (14) adjacent faces of a cube of side 2m as shown in figure. Determine the resultant of the forces.





The system of bodies shown in Figure starts from rest. Determine the (14) acceleration of body B and the tension in the string supporting body A.



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constant tangential acceleration of 0.6m/s^2 . Determine the distance and the time for which that car will travel before the magnitude of the total acceleration attained by it becomes 0.75m/s^2 .

- A projectile is projected in air with a velocity 100 m/s and at an angle of 30⁰ with (6) horizontal. Find i) horizontal Range ii) maximum height and iii) time of flight.
 MODULE 5
- 19 a A flywheel increases its speed from 30 r.p.m. to 60 r.p.m. in 10 seconds. (6)
 Calculate (i) the angular acceleration and (ii) Number of revolutions made by the wheel in 10 seconds.
 - b The rotation of a fly wheel defined by the equation, $\omega = 3t^2 2t + 2$, where ω is in (8) rad/s and t is in seconds. After 1s from the start, the angular displacement was 4 radians. Determine the angular displacement, angular velocity and angular acceleration of fly wheel when t = 3s.
- 20 a A body moving with SHM has velocities of 8m/s and 3 m/s at 1.5 and 2.5 m (7) distance from the centre. Find the amplitude and time period of the body.
 - b The rotor and the shaft weights 2500 N and the radius of gyration with respect to (7) the axis of rotation is 250 mm calculate the acceleration of the falling weight
 450N if the shaft radius is 125 mm.



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