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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S1 (S,FE) S2 (S,FE) Examination May 2025 (2019 Scheme)

Course Code: EST100 Course Name: ENGINEERING MECHANICS (2019 -Scheme)

Max. Marks: 100

Duration: 3 Hours

UTH

Pages: 5

PART A

	Answer all questions, each carries 3 marks	Marks
1	The greatest and least resultant of two forces acting on a body are 40kN and 5kN.	(3)
	Determine the magnitude of the forces.	
2	A wooden decorative ball having weight 10 N hangs from a smooth vertical wall	(3)
	by a string. The point of contact between the ball and the wall is A. The angle	
	between the wall and the string is 20°. Determine the tension in the string and	
	reaction at A.	
3	State Coulomb's laws of friction.	(3)
4	Explain types of supports with sketches.	(3)
5	State and explain the first theorem of Pappus Guldinus	(3)
6	Determine the moment of inertia of a triangular lamina about the centroidal axis	(3)
	parallel to the base, if its base is 100mm and height is 200mm.	
7	The velocity of a particle moving in a straight line is given by the expression	(3)
	$v = t^3 - t^2 - 2t + 2$. The particle is found to be at a distance 4 m from station A	
	after 2 seconds. Determine the acceleration and displacement after 4 seconds.	
8	A body is projected at an angle such that its horizontal range is 3 times the	(3)
	maximum height. Find the angle of projection.	
9	Power supply was cut off to a power-driven wheel when it was rotating at a speed	(3)
	of 900 rpm. It was observed to come to rest after making 360 revolutions.	
	Determine its angular retardation and time it took to come to rest after power	

- supply was cut off.
- The amplitude of a particle in simple harmonic motion is 0.75m and the period is (3)
 1.2 seconds. Determine the maximum velocity and maximum acceleration.

PART B

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

MODULE 1

11 a A rope 9m long is connected at A and B, two points on the same level, 8m apart. (7)
 A load of 300N is suspended from a point C on the rope, 3 m from A. What load
 connected to a point D on the rope, 2 m from B is necessary to keep portion CD
 parallel to AB.



b Four forces are acting at a point as shown in the figure. Find the resultant of the (7) system of forces.



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Two balls A and B are resting in equilibrium as shown in the figure below. Ball A (14) is in contact with a vertical wall at point D. Ball B is in contact with an inclined wall (inclination with horizontal is 60°) at point E and horizontal surface at point Q. Diameters of ball A and B are 10cm and 18 cm respectively. Weights of ball A and B are 15 N and 45 N respectively. Determine the reactions at points of contact E, Q and D. The base of the channel is 18 cm.



MODULE 2

13 a Explain the different types of beams with sketches.

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(6)

b For the beam with loading shown in figure, determine the reactions at the support (8)





14 A uniform ladder 6m long weighing 300N is resting against a wall with which it (14) makes 30° to wall. A man weighing 750N climbs up the ladder. At what position along the ladder from the bottom end does the ladder slips. The coefficient of friction for both the wall and the ground with ladder is 0.2.

MODULE 3

The cross section of a machine part is shown in the figure below. Determine the (14) moment of inertia of the shaded region about the centroidal axes. All dimensions in mm.



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Three forces P, Q and R are applied along the diagonals of a rectangular (14) parallelopiped as shown in the figure. If 2P = 2Q = R = 1000N. Determine the equivalent force at the origin.



MODULE 4

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Two blocks A and B are held stationary 10m apart on a 20° inclined surface. Block (14) A is having weight 250N and block B is having weight 500N. Coefficient of friction between the inclined surface and block A is 0.3 and that between block B and inclined surface is 0.2. Block weighing 250N is below the block weighing 500N. If the blocks are released simultaneously, calculate the time taken and the distance travelled by each block before they are at the verge of collision.

OR

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- 18 a A projectile is aimed at a target on the horizontal plane and falls 12m short when (7) the angle of projection is 15°, while it overshoots by 24m when the angle is 45°.
 Find the angle of projection to hit the target.
 - b A stone is dropped from the top of a tower 70 m high. At the same time another (7) stone is thrown up from the foot of the tower with a velocity of 30 m/s. At what distance from the top and after how much time the two stones cross each other?

MODULE 5

19 The composite pulley shown in the figure weighs 800N and has a radius of gyration (14) of 0.6m. The 2000N and 4000N blocks are attached to the pulley by inextensible strings as shown in the figure. Neglecting weight of the strings, determine the tension in the strings and angular acceleration of the pulley.



OR

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A particle moving with SHM has an amplitude of 4.5m and period of oscillation (14) is 3.5 seconds. Find the time required by the particle to pass two points which are at a distance of 3.5m and 1.5m from the centre and on the same side of mean position.