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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S2 (R,S) Examinations April 2026 (2024 Scheme)

Course Code: GBEST213
Course Name: ENGINEERING MECHANICS

Max. Marks: 60 Duration: 2hours 30minutes

PART A

(Answer all questions. Each question carries 3 marks)

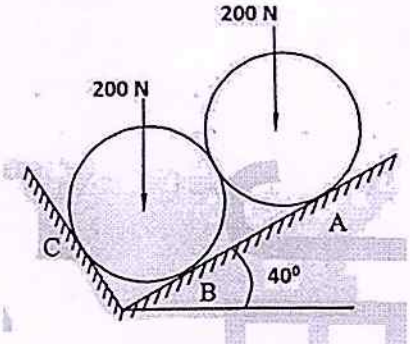
		CO	Marks
1	State and explain parallelogram law of vectors with neat sketch.	CO1	(3)
2	Define Free body diagram with an example.	CO1	(3)
3	Distinguish between Static friction and Dynamic friction.	CO2	(3)
4	Show that angle of repose is equal to angle of friction.	CO2	(3)
5	State and Explain D'Alembert's Principle.	CO5	(3)
6	Explain Instantaneous centre of rotation with a neat sketch.	CO5	(3)
7	What is equivalent stiffness of a spring? Write the expression for equivalent stiffness of springs arranged in series and parallel.	CO5	(3)
8	Define degree of freedom with suitable examples.	CO5	(3)

PART B

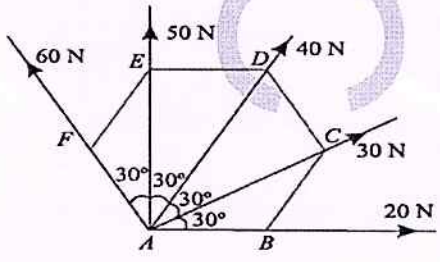
(Answer any one full question from each module, each question carries 9 marks)

Module -1

9	Two identical rollers each weighing 200N are supported by an inclined plane inclined at 40^0 to the horizontal and a wall, at right angles to the inclined plane as shown in the figure. Find the reactions at the supports A, B and C. Neglect friction.	CO2	(9)



10 The forces 20 N, 30 N, 40 N, 50 N and 60 N are acting at one of the angular points of a regular hexagon, towards the other five angular points, taken in order. Find the magnitude and direction of the resultant force.

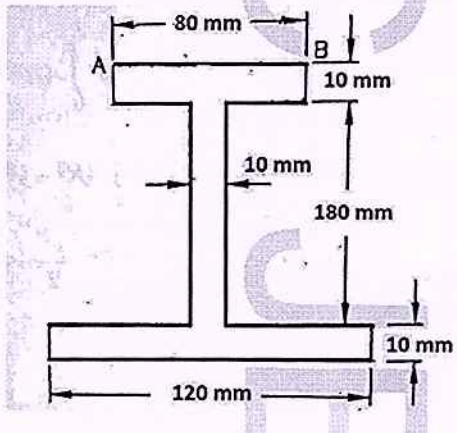


CO2 (9)

Module -2

11 A uniform ladder of length 13 m and weighing 25 N is placed against a smooth 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. CO4 (9)

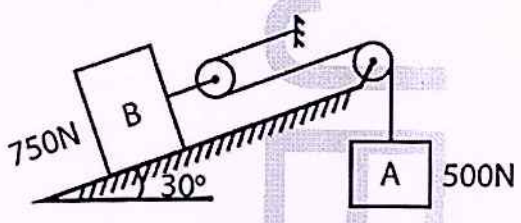
12 Calculate the moment of inertia of the given section about its centroidal axes.



CO4 (9)

Module -3

13 The system of bodies starts from rest. Determine the acceleration of body B and the tension in the string supporting body A. Coefficient of friction between B and inclined plane is 0.45. CO5 (9)



14 The motion of a particle along a straight line is defined as $S = 30t+10t^2-5t^3$, where S is in meters and t is in seconds. Find (i) the velocity and acceleration at the start (ii) the time the particle reaches maximum velocity and (iii) the maximum velocity of the particle. CO5 (9)

Module -4

15 A particle is performing simple harmonic motion. When it is at a distance of 10 cm and 12 cm from the mean position, its velocities are 1.2 m/s and 0.8 m/s. Find the amplitude of oscillations, its maximum velocity and maximum acceleration. CO5 (9)

16 A body of mass 50kg is suspended by two springs of stiffness 4kN/m and 6kN/m as shown in the figures a & b. The body is pulled 30mm down from its equilibrium position and then released. For both cases, calculate (i) the frequency of oscillation (ii) maximum velocity and (iii) maximum acceleration. CO5 (9)

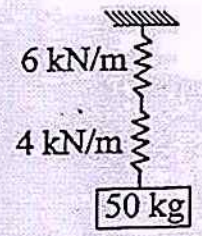


Fig. (a)

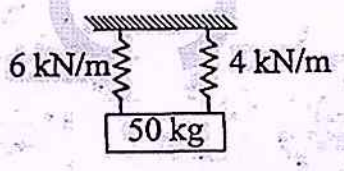


Fig. (b)