Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S2 (S) Examination January 2026 (2024 Scheme)

Course Code: GBEST213

Course Name: ENGINEERING MECHANICS

Max. Marks: 60 Duration: 2 hours 30 minutes

PART A

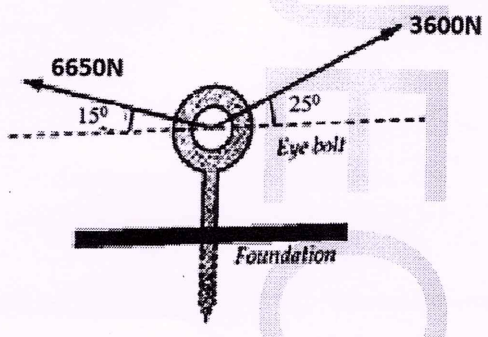
	(Answer all questions. Each question carries 3 marks)	CO	Marks
1	The maximum and minimum resultant of two forces acting on a particle are 50 kN and 10 kN, respectively. If 50 kN is the magnitude of the resultant for the given system of forces F_1 and F_2, determine the angle between F_1 and F_2.	CO2	(3)
2	A force $F = 2i + 4j - 3k$ (N) passes through a point P (1,1,-2). Calculate the moment of the force about a point (2,-1,2)	CO1	(3)
3	Define the terms: (i) Angle of friction (ii) Angle of repose	CO2	(3)
4	State and explain the perpendicular axis theorem.	CO4	(3)
5	State and explain D'Alembert's principle with equation.	CO4	(3)
6	A particle is moving with uniform acceleration and covers 10m in the fourth second and 25m in the tenth second. Determine the initial velocity of the particle and its acceleration.	CO5	(3)
7	Explain degrees of freedom.	CO5	(3)
8	A helical spring of weight 80 N is hung vertically and subjected to vibration. The weight makes 4 oscillations per second. Calculate the stiffness of the spring.	CO5	(3)

PART B

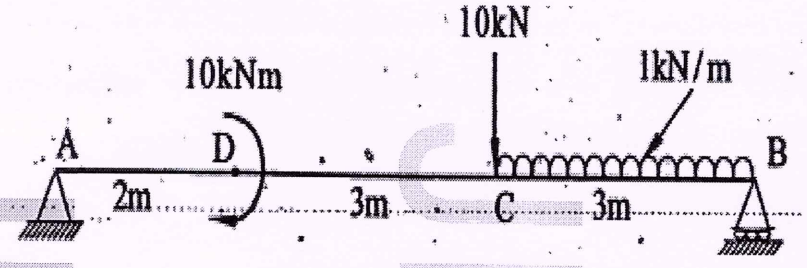
(Answer any one full question from each module, each question carries 9 marks)

Module -1

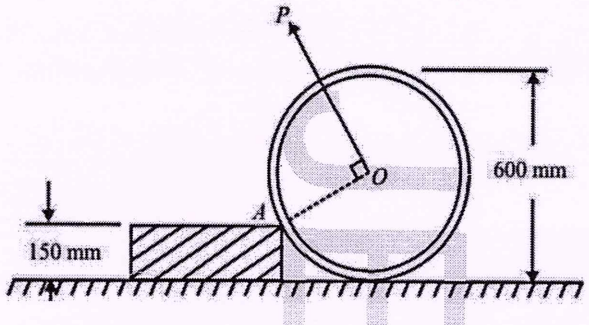
9 a) Two wires are attached to a bolt in a foundation as shown in the figure. Determine the resultant pull exerted by the bolt on the foundation. CO3 (5)



b) Determine support reactions of the beam. CO3 (4)

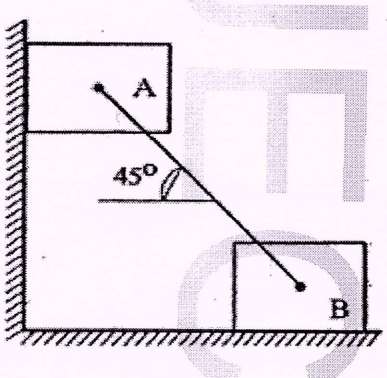


10 A uniform wheel of 600 mm diameter, weighing 0.9 kN rests against a rigid rectangular block of 150mm height as shown in figure. Find the least pull, through the centre of the wheel, required just to turn the wheel over the corner A of the block. Also find the reaction of the block. Take the entire surface to be smooth. CO3 (9)

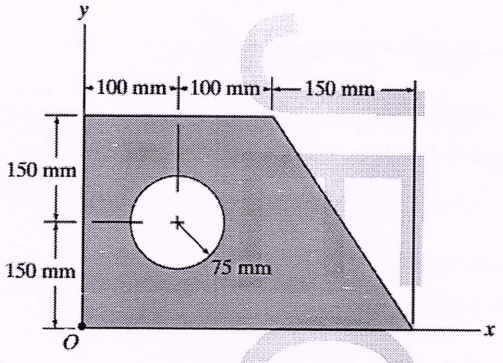


Module -2

11 Two identical blocks A and B weighing W are supported by a rigid bar inclined at 45^0 to horizontal as shown below. If both blocks are in limiting equilibrium, find the coefficient of friction assuming it to be same for all contact surfaces. CO4 (9)



12 Determine the moment of inertia of the shaded area about the x axis. CO4 (9)



Module -3

13 a) The motion of a particle is defined by the relation $x = 7.5 + 22.5t - 13.5t^2 + 1.5t^3$ where x is in metres and t is in seconds. Determine CO5 (5)

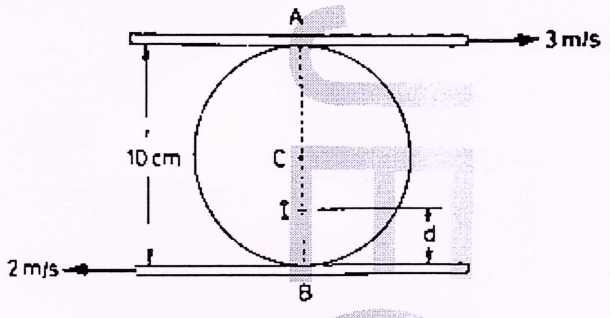
(i) the position when the velocity is zero and
(ii) the total distance travelled when the acceleration is zero

b) An elevator of weight 5 kN is moving vertically downward with uniform acceleration. Starting from rest, it travels a distance of 10 metres in 5 seconds. Determine the tension in the lift cable during this time. CO5 (4)

14 A roller of radius 5cm rides between two horizontal bars moving in the opposite directions as shown in the figure. Calculate the distance 'd' defining the position of the instantaneous centre of rotation of the roller. Assume no- CO5 (9)

slip conditions at the points of contact A and B. Also, locate the position of the instantaneous centre when both the bars are moving in the

same direction.



Module -4

15 A weight of 50N suspended from a spring vibrates vertically with an amplitude of 7.5cm and a frequency of 1 oscillation per second. Find CO5 (9)

(a) the stiffness of the spring

(b) maximum tension induced in the spring, and

(c) maximum velocity of the weight.

16 A body, moving with simple harmonic motion, has an amplitude of 1.5m and a period of oscillation of 3 seconds. Find the velocity and acceleration of the body at t=0.5 seconds, when time is measured from, CO5 (9)

(i) the mean position and
(ii) the extreme position.

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