Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S1 (R,S) Examination December 2025 (2024 Scheme)

Course Code: GCEST103

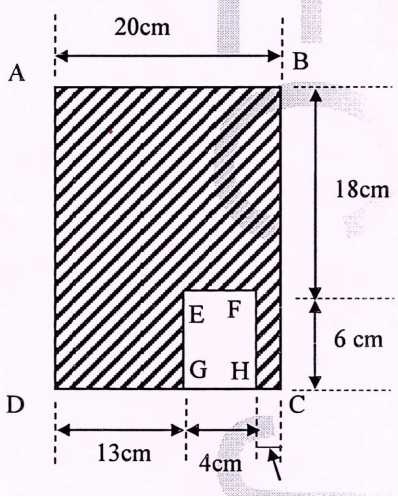
Course Name: ENGINEERING MECHANICS

Max. Marks: 60 Duration: 2 hours 30 minutes

PART A

(Answer all questions. Each question carries 3 marks)

		CO	Marks
1	Explain free body diagram with an example.	CO2	(3)
2	A force H = 800 N is directed from point E (5, 8,6) meters towards a point F (-10, -3, -8) meters. Determine the force vector H.	CO1	(3)
3	A body of weight 150 N is placed on a rough horizontal plane. Determine the coefficient of friction if a horizontal force of 120 N just causes the body to slide over the horizontal plane.	CO2, CO3, CO4	(3)
4	From a rectangular lamina ABCD 20cm x 24 cm, a rectangular hole EFGH of 4cm x 6cm is cut as shown in figure. Find the center of gravity of the reminder lamina from the left and bottom side of the figure?	CO4	(3)



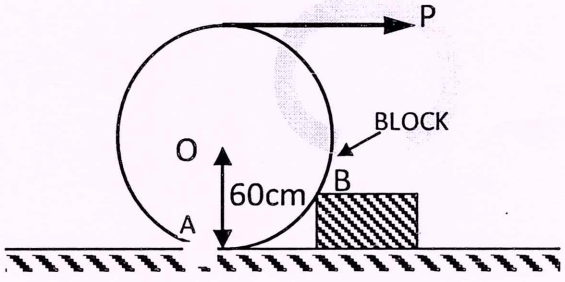
5		A car is moving with a velocity of 50m/s. The car is brought to rest by applying brakes in 15 seconds. Determine the retardation and distance travelled by the car after applying brakes.	CO4, CO5	(3)
6		A lift has an upward acceleration of 2.5m/s^2, what force a man weighing 1000N exert on the lift floor?	CO3,CO4, CO5	(3)
7		A pilot drops a parcel from a height of 2000m with a uniform horizontal velocity of 50m/s. At what distance the parcel will hit the ground with respect to initial drop point?	CO4, CO5	(3)
8		The armature of an electric motor, has angular speed of 1500rpm at the instant when it is switched off. If it comes to rest in 10 sec, calculate the angular deceleration, assuming it is constant.	CO4, CO5	(3)

PART B

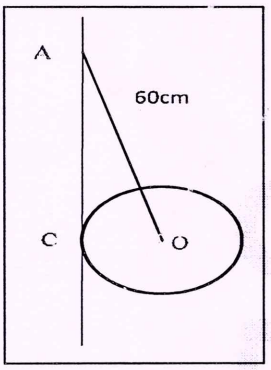
(Answer any one full question from each module, each question carries 9 marks)

Module -1

9	a)	A roller of radius 60cm weighing 500N is to be pulled over a rectangular block of height 15 cm as shown in figure, by a horizontal force applied at the end of a string wound round the circumference of the roller. Find the magnitude of the horizontal force which will just turn the roller over the corner of the rectangular block? Also determine the magnitude and direction of reaction at A and B. All surface may be taken as smooth.	CO2, CO3, CO4	(6)

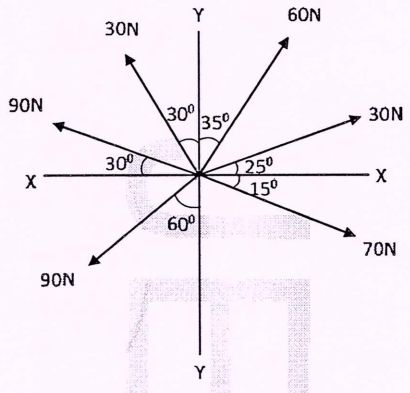


	b)	A circular roller of weight 600 N and radius 20cm hangs by a thread AO = 60cm and rest against a smooth vertical wall at C shown in figure. Determine the tension in the thread and reaction at point C.	CO2, CO3 CO4	(3)



10 a) A force F = 6i+8j-9k is applied at a point A (6,6,-12). Find the moment of the force F about the point B (1,-3,4) CO1 (4)

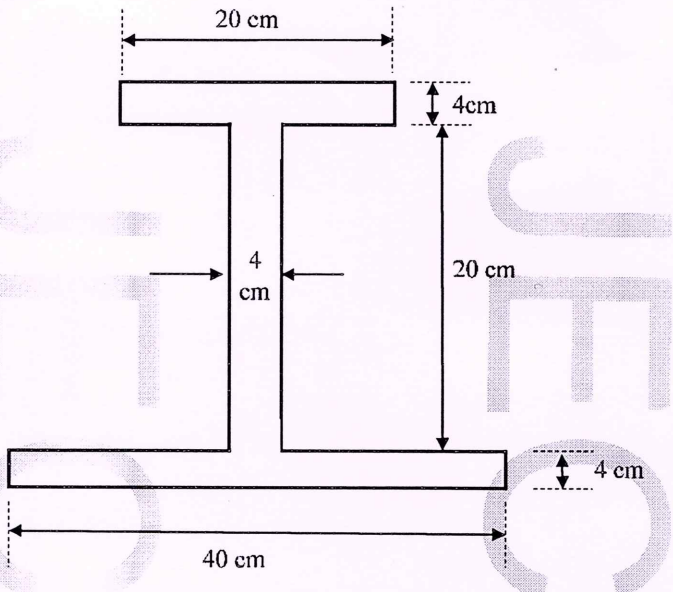
b) Find the magnitude and direction of the resultant of forces acting at a point as shown in figure. CO3,CO4 (5)



Module -2

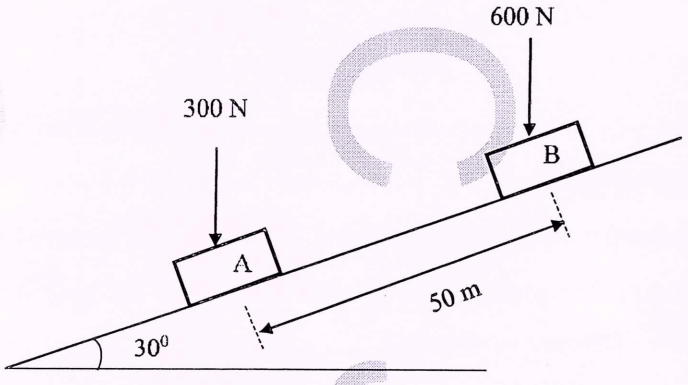
11 a) An effort of 250 N is required just to move a certain body up an inclined plane of angle 20^0, the force acting parallel to the plane. If the angle of inclination of the plane is made 40^0, the effort required again applied parallel to the plane, is found to be 400N, Find the weight of the body and the coefficient of friction? CO2, CO3, CO4 (9)

12 a) Find the moment of inertia of the section shown in figure about the centroidal axis X-X perpendicular to the web CO4 (9)

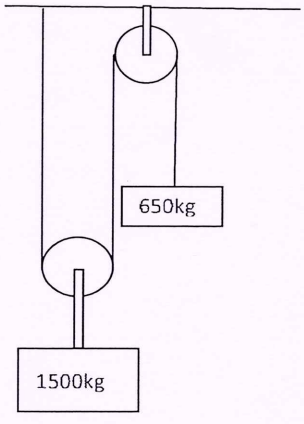


Module -3

13 a) A block A and B are held stationary 50 m apart on 30^0 inclination as shown in figure. The coefficient of friction between the plane and block A is 0.4 while it is 0.15 between the plane and the block B. 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. Solve utilizing D Alembert's principle CO3, CO4, CO5 (9)



14 a) Determine the tension in the string and acceleration of the two bodies of mass 1500 kg and 650kg connected by a string and frictionless and weightless pulley as shown in figure CO4, CO5 (9)



Module -4

15	a)	A particle is projected with a velocity of 100m/s in air at an angle α with the horizontal. The x and y coordinate of a point lying on the trajectory of the particle with respect to point of projection are 100 m and 30 m respectively. Find the angle of projection of the particle?	CO4, CO5	(5)
	b)	A particle is projected in air with a velocity of 200m/s and at an angle of 30^0 with the horizontal. Find the horizontal range and the maximum height reached by the particle?	CO4, CO5	(4)
16	a)	A flywheel rotates with constant retardation. In the first 15 second it made 400 revolutions. At t = 10sec, its angular velocity was 160 rad/sec. Determine i) angular retardation ii) total time taken to come to rest iii) total revolutions made till it comes to rest	CO4, CO5	(9)

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