Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S1 (S) Examination May 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)

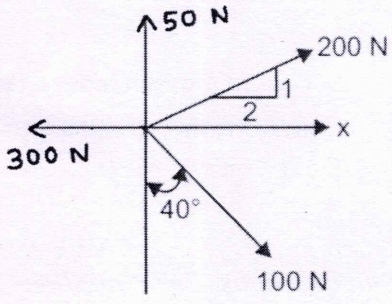
		CO	Marks
1	A force $\vec{F} = 9i + 3j - 6k$ passes through a point whose position vector is $3i - 4j + 8k$. Find the moment of force about a point B whose position vector is $5i - 3j - 7k$.	CO4	(3)
2	What is force system? List out system of forces.	CO2	(3)
3	Can we always use the formula $F = \mu_s R_N$ to determine the frictional force? Explain why?	CO4	(3)
4	Explain the term polar moment of inertia of an area with a neat sketch and necessary equations.	CO4	(3)
5	State and explain D' Alembert's principle.	CO4	(3)
6	A car was moving at a speed of 15 m/s, when the brakes are fully applied causing all four wheels to skid. Determine the time required to stop the car. The coefficient of friction between the road and tire is 0.3.Weight of the car is 8000N	CO5	(3)
7	Distinguish between rectilinear translation and curvilinear translation.	CO5	(3)
8	A flywheel starts from rest and accelerates uniformly with $\alpha = 3$ rad/s^2 for t = 4s. Find the number of revolutions it completes during this time.	CO5	(3)

PART B

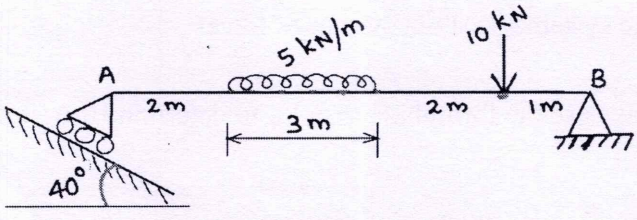
(Answer any one full question from each module, each question carries 9 marks)

Module -1

9	Four forces 200N, 50N, 300N and 100N are acting at a point as shown. Find magnitude and direction of the resultant.	CO4	(9)

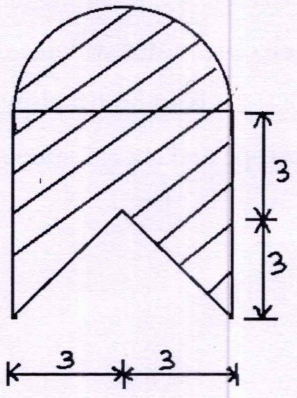


10	A beam of length 8m is loaded as shown in figure. Determine the components of reactions at the supports.	CO3	(9)



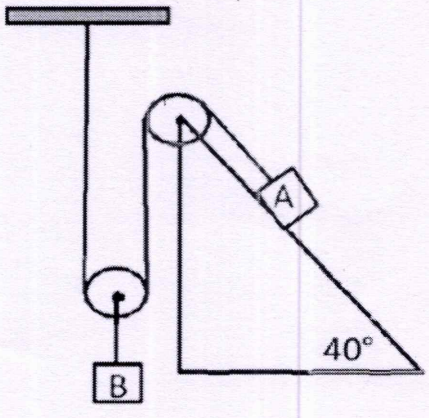
Module -2

11	A uniform ladder of weight 300 N and 6 m long is leaning against a vertical wall. The ladder also supports a vertical load of 700N at a distance 5m (measured parallel to ladder) from bottom end. The coefficient friction between floor and ladder is 0.2 and that between wall and ladder is 0.3. Determine the smallest angle with floor, for which ladder can remain in equilibrium without slipping.	CO3	(9)
12	Compute the moment of inertia of the shaded area about the horizontal centroidal axis. All dimensions are in cm.	CO4	(9)



Module -3

13 Find tension in the string and acceleration of blocks connected by a string and two weightless pulleys as shown in figure. Mass of A= 20kg; Mass of B= 50kg. Take $\mu = 0.2$ CO5 (9)



14 An elevator cage of weight 4500N (including the weight of man) starts moving upwards with a constant acceleration. Starting from rest it acquires a velocity of 1.8 m/s after travelling a distance of 2m. Find the tension in the cables of elevator. CO5 (9)

Also find the force exerted by a man weighing 600N on the floor of the lift when the elevator moves up with a retardation of $1 m/s^2$.

Module -4

15 A wheel rotating about a fixed axis at 20 rpm is uniformly accelerated for 70 seconds during which it makes 50 revolutions. Find (i) angular velocity at the end of this interval (ii) time required for the speed to reach 100rpm from starting. CO5 (9)

16	A cylindrical pulley of mass 800 kg, having 0.8m radius of gyration and 2m diameter is rotated by an electric motor which exerts a uniform torque of 60 kNm. A body of mass 3000 kg is to be lifted by a rope wrapped round the pulley. Find tension in the rope and acceleration of the body.	CO5	(9)

***