Roll No									

राष्ट्रीय प्रौधोगिकी संस्थान गोवा

NATIONAL INSTITUTE OF TECHNOLOGY GOA

Farmagudi, Ponda, Goa, 403401

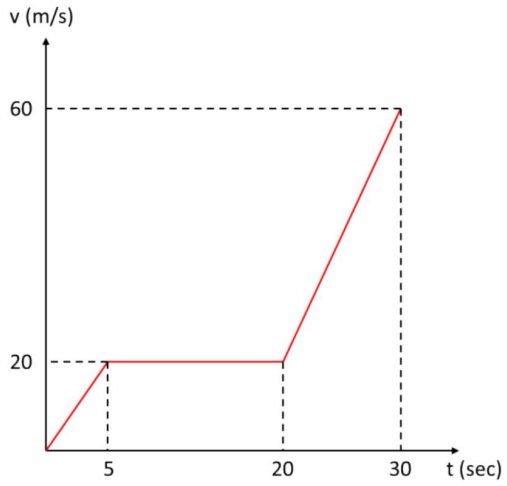
Programme Name: **B.Tech**

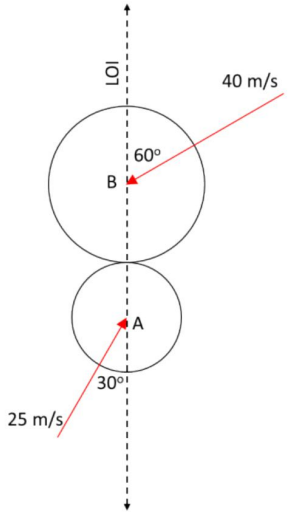
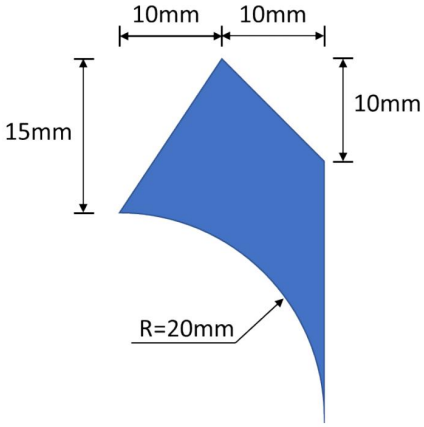
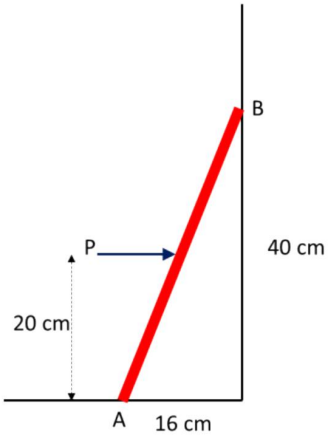
End Semester Examination, April-2021

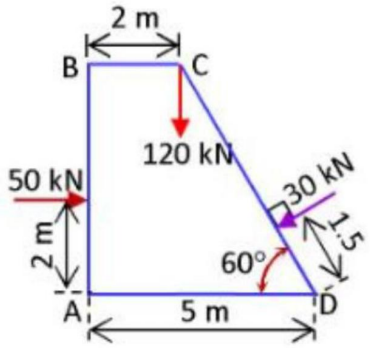
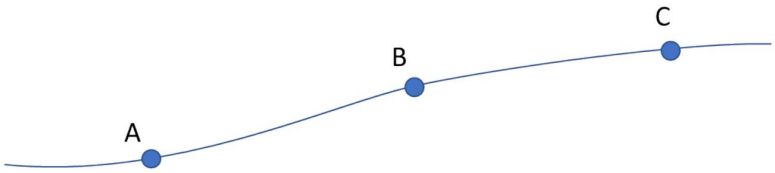
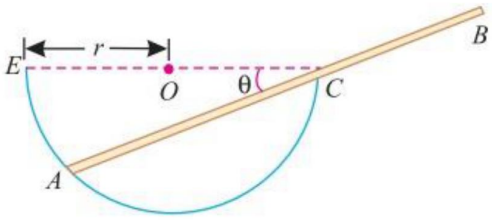
Course Name:	Engineering Mechanics	Course Code:	ME100
Date:	08th April, 2021	Time:	09:30 AM – 12:30 PM
Duration:	3 hours	Max. Marks:	100

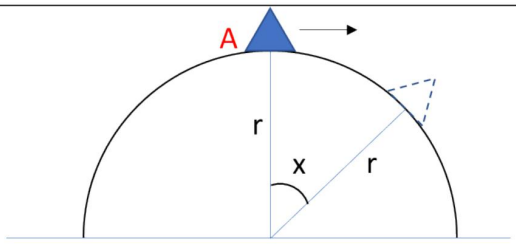
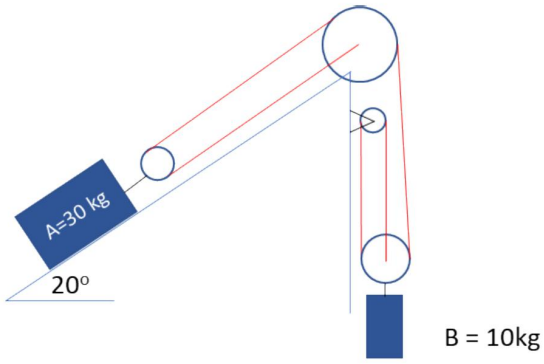
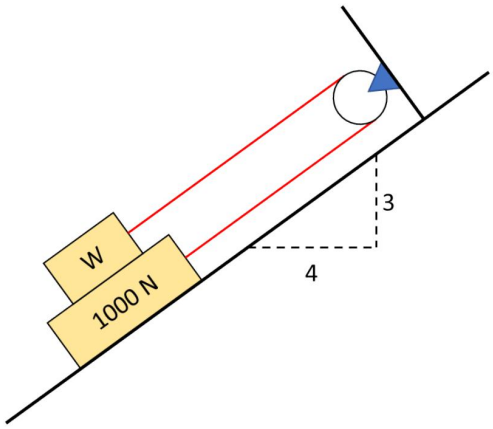
ANSWER ALL QUESTIONS

(Assume suitable data wherever applicable; g = 9.81 m/sec^2)

1.	The motion of jet plane while travelling along a runway is defined by the v-t graph as shown in Figure 1. Construct the s-t graph for the motion. The plane starts from rest.  Figure 1	6 M
2.	Mass A = 3kg; Mass B = 4kg Initial Velocity of A = 25m/s Initial Velocity of B = 40m/s Find magnitude and direction after impact. Refer Figure 2.	8 M

	 Figure 2	
3.	Find the centroidal moment of inertia for figure 3, along X and Y direction.  Figure 3	15 M
4.	Weight of rod AB = 100 N. If coefficient of friction μ = 0.15 at A and B, calculate range of value of P for which equilibrium is maintained.  Figure 4	8 M
5.	A dam is subjected to three forces as shown in figure 5, determine the single equivalent force and locate its point of intersection with base AD	6 M

	 Figure 5	
6.	A driver uniformly decelerates from 100km/hr. speed at A to 50km/hr. speed at C. Distance AB is 60m, distance BC is 60m. The driver experiences total acceleration of 3m/s^2 at A. The radius of curvature at C is 150m. Calculate: Radius of curvature at A; Acceleration at B (point of inflection → no curvature point); Total acceleration at C.  Figure 6 – Profile of curve	8 M
7.	A particle moves in a way that its rotation in radians is given as θ=0.3t+0.03t^3. The particle also moves radially and is governed by following equation r=0.3+0.06t^2, where r is in meters. The time 't' is in seconds. Find its velocity and acceleration at time t=3 seconds.	6 M
8.	A uniform rod AB of length 3r remains in equilibrium on a hemispherical bowl of radius r as shown in figure 7. Ignoring friction find the inclination of rod (θ) with the horizontal  *Figure 7*	6 M
9.	A triangular parcel of mass m is given a speed of 'v' at point A where velocity is defined as $2 * v = \sqrt{gr}$ at point A. Find the angle 'x' at which the parcel leaves the circular track. Use work energy method.	8 M

	 *Figure 8*	
10.	Determine accelerations of bodies A and B upon release from rest. Neglect mass of pulley, coefficient of friction between block and surface is 0.15.  *Figure 9*	8 M
11.	Find the range of values for weight 'W' for which the 1000 N block will not move. Coefficient of friction between all surfaces is 0.3. Pulley is frictionless.  *Figure 10*	10 M
12.	What are the various idealizations in engineering mechanics? Explain where you have used them in your learning of engineering mechanics.	5 M