3/2/23

Reg. No.												

Question Paper Code	11680

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV/DEC 2022

Second Semester

Civil Engineering

(Common to Third Semester - Mechanical Engineering and Mechanical and Automation Engineering)

20ESCE201 - ENGINEERING MECHANICS

(Regulations 2020)

Duration: 3 Hours

Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

		Marks, K-Level,CO
1.	What is the different between a resultant force and equilibrant force?	*2,K1,CO1*
2.	State Principle of Transmissibility.	*2,K1,CO1*
3.	Find the support reactions of a cantilever beam of span 6 m carrying a UDL of 10 kN/m.	*2,K2,CO2*
4.	Why the Couple moment is said to be a free vector?	*2,K1,CO2*
5.	When do we say that the motion of a body is impending?	*2,K1,CO3*
6.	Why is Static coefficient of friction always greater than Kinetic coefficient of friction?	*2,K1,CO3*
7.	A quarter circular lamina having radius 50 mm is located in the XY plane such that its radial edges coincides with X and Y axes. Determine Y- coordinate of it's centroid.	*2,K2,CO4*
8.	Define the Parallel axis theorem to calculate the area moment of inertia.	*2,K1,CO5*
9.	A train changes its speed uniformly from 100 to 50 km/hr in a distance of 500 m. What is its acceleration?	*2,K2,CO6*
10.	A ball dropped from the top of a tower reaches the ground in 6 sec. What is the height of the tower?	*2,K2,CO6*

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

11.	a)	A load **Q** is applied to the pulley C, which can roll on the cable ACB. The pulley is held in the position shown in Fig.1 by a second cable CAD, which passes over the pulley A and supports a load **P**. Knowing that P = 800 N, determine (i) the tension in cable ACB, (ii) the magnitude of load **Q**.	*13,K3,CO1*

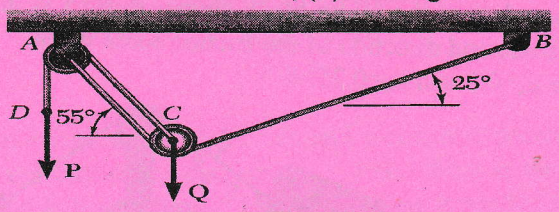

Fig.1

OR

	b)	Three cables are used together a balloon as shown in fig.2. Determine the Vertical force P exerted by the balloon at A, knowing that the tension in cable AB is 259 N.	*13,K3,CO1*

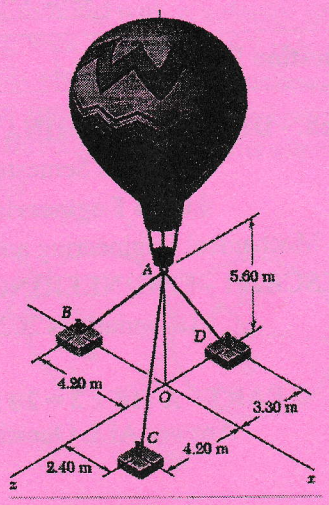

Fig.2

12. a) Fig.3 shows two vertical forces and a couple of moment 2000 N-m acting on a horizontal rod which is fixed at end A. Determine the resultant of the system. *13,K3,CO2*

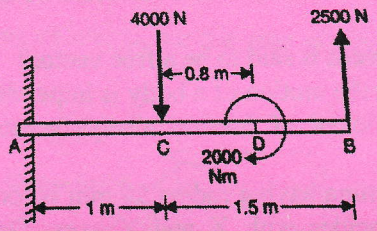

Fig.3

OR

b) Determine the resultant of the force system shown in the fig.4. Assume that the coordinates of different points are in meters. *13,K3,CO2*

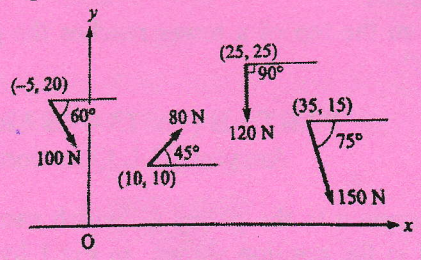

Fig.4

13. a) Determine whether the 10 kg block shown in fig.5 is in equilibrium, and find the magnitude and direction of the friction force when P = 40 N and θ = 20°. Take μ_s=0.3 and μ_k=0.25. *13,K3,CO3*

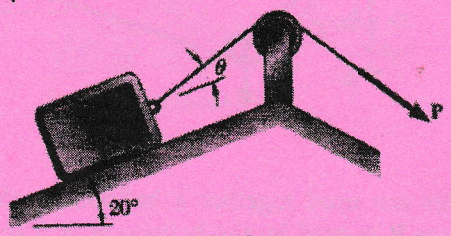

Fig.5

OR

b) A uniform ladder of length 3.25m and weighing 250N is placed against a smooth vertical wall with its lower end 1.25 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. Refer fig.6. *13,K3,CO3*

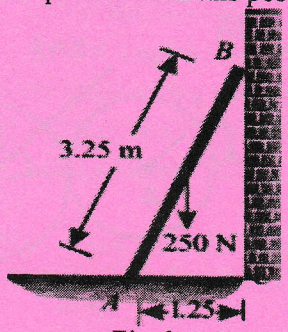

Fig.6

14. a) Determine the centroid of the remaining portion of a circular sheet of metal of radius 50cm when a hole of 10cm radius is taken out from the Centre of the circular disc along its horizontal diameter as shown in fig.7. *13,K3,CO4*

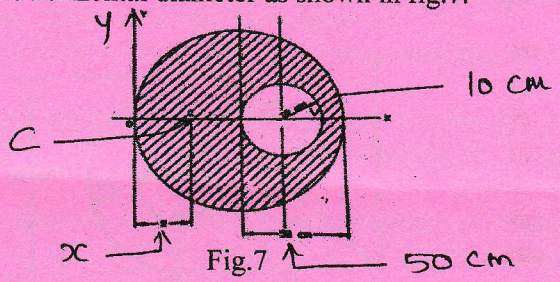

Fig.7

OR

b) A uniform lamina shown in Fig.8 consists of a rectangle, a circle and a triangle. Determine the centre of gravity of the lamina. *13,K3,CO4*

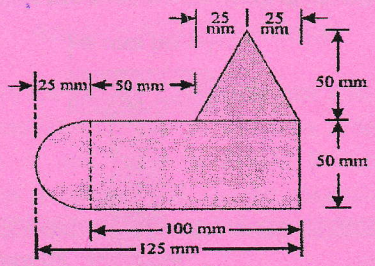

Fig.8

15. a) (i) A car has an initial speed of 25 m/s and a constant deceleration of $3m/s^2$. Determine the velocity of the car when t=4s. What is the displacement of the car during the 4s time interval? How much time is needed to stop the car? *7,K3,CO6*

(ii) A projectile is fired with an initial velocity of 250 m/s at a target located at a horizontal distance of 4 km and vertical distance of 700 m above the gun. Determine the value of firing angle to hit the target. Neglect air resistance. *6,K3,CO6*

OR

b) A ball 'A' of mass 2 kg moving with a velocity of 6 m/s strikes another ball 'B' of mass 4 kg moving with a velocity of 2 m/s at the instant of impact the velocities of the two balls are parallel and inclined at 30° to the line joining their centers as shown in figure below. If the coefficient of restitution is 0.4, find the velocity and the direction the two balls after impact. Refer fig.9. *13,K3,CO6*

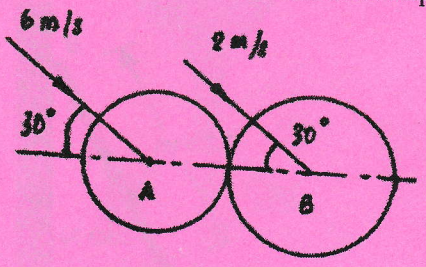

Fig.9

PART - C (1 × 15 = 15 Marks)

16. a) Determine the moment of inertia for the area given below about axis AB. Refer fig.10. *15,K3,CO5*

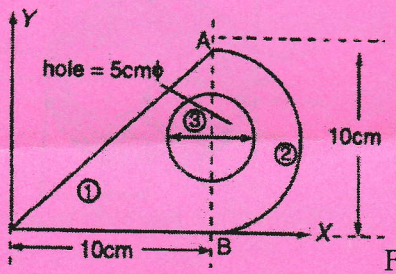

Fig.10

OR

b) Find the Moment of inertia of the section about the horizontal axis passing through the center of gravity of the section. Refer fig.11. *15,K3,CO5*