

**PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(AUTONOMOUS)**

I B.Tech II Semester Regular Examinations, June-2024

**ENGINEERING MECHANICS
(Common to CIVIL and ME)**

Time: 3 hours

Max. Marks: 70

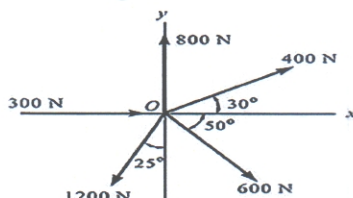
Note:

- i. Question No. 1 shall contain 10 compulsory short answer questions (2 questions from each unit) for a total of 20 marks such that each question carries 2 marks.
- ii. In each of the questions from 2 to the last question, there shall be either/or type questions of 10 marks each.

Q. No.	Questions	BTL	CO	Marks
1.	a) What are the characteristics of a force?	K2	CO1	2M
	b) Define couple.	K1	CO1	2M
	c) State the conditions of equilibrium of a co-planar non-concurrent force system.	K1	CO2	2M
	d) Define moment of a force.	K1	CO2	2M
	e) Distinguish between centroid and centre of gravity.	K2	CO3	2M
	f) What is radius of gyration?	K1	CO3	2M
	g) Differentiate between statics and dynamics.	K2	CO4	2M
	h) Define rectilinear and curvilinear of a particle.	K1	CO4	2M
	i) State the equation of motion for a rigid body rotating about a fixed axis.	K2	CO5	2M
	j) Define impulse and momentum.	K1	CO5	2M

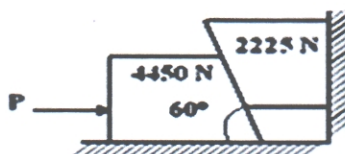
UNIT-I

2.	Determine magnitude and direction of the resultant of the five coplanar concurrent forces acting at point O as shown in figure.	K3	CO1	10M
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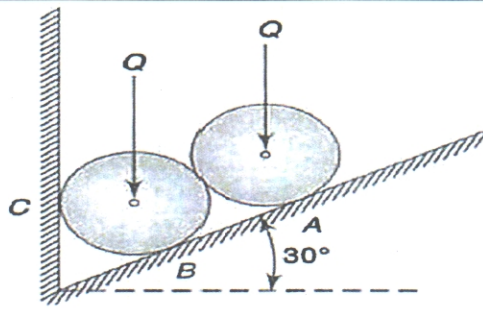
OR

3.	Referring to the Figure the coefficient of friction is as follows: 0.25 at the floor, 0.30 at the wall, 0.20 between the blocks. Find the minimum value of a horizontal force P applied to the lower block that will hold the system in equilibrium.	K3	CO1	10M
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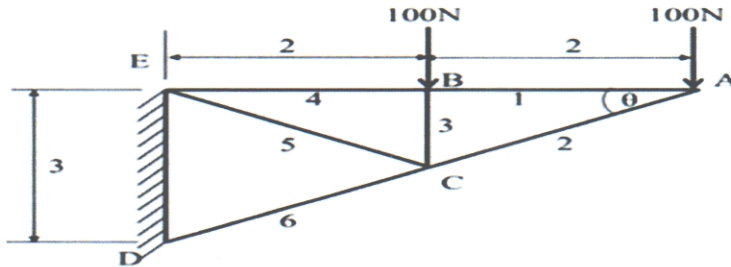
UNIT-II

4.	Two identical rollers, each of weight $Q=445\text{ N}$, are supported by an inclined plane and a vertical wall as shown in figure. Assuming smooth surfaces, find the reactions induced at the points of support A, B and C.	K3	CO2	10M
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OR

5. Determine the axial force in each bar of the plane truss loaded as shown in the figure.



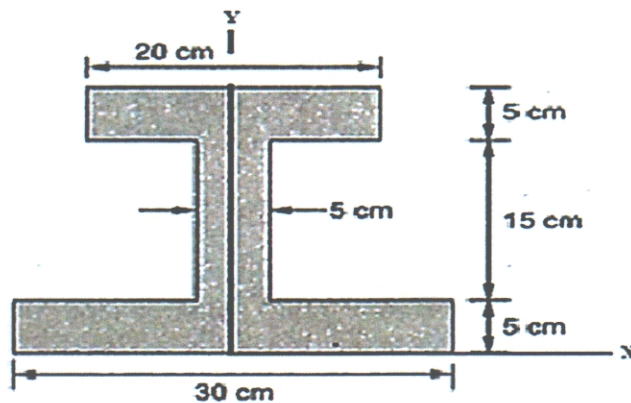
K3

CO2

10M

UNIT-III

6. Locate the centroid of the I – section shown in figure.



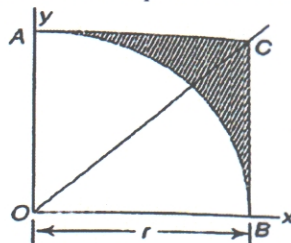
K3

CO3

10M

OR

7. Calculate the Moment of Inertia of shaded portion about X-axis.



K3

CO3

10M

UNIT-IV

8. a) Differentiate kinematics and kinetics
b) A small steel ball is shot vertically upwards from the top of a building 25m above the ground with an initial velocity of 18m/s. (a) In what time, it will reach the maximum height (b) How high above the building will ball rise (c) Compute the velocity with which it will strike the ground and the total time it is in motion.

K2

CO4

5M

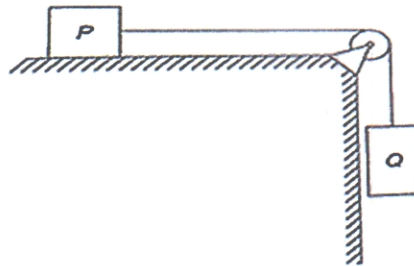
K3

CO4

5M

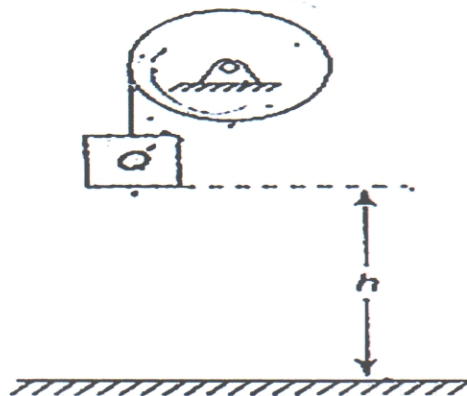
OR

9.	a)	State and explain D'Alembert's principle.	K2	CO4	5M
	b)	Two blocks of weights P and Q are connected by a flexible but inextensible cord and supported as shown in Fig. If the coefficient of friction between the block P and the horizontal surface is μ and all other friction is negligible, find (a) the acceleration of the system and (b) the tensile force S in the cord. The following numerical data are given: $P = 53.4\text{N}$; $Q = 26.7\text{N}$; $\mu = 1/3$.	K3	CO4	5M



UNIT-V

10.	a)	Define the terms angular displacement, angular velocity and angular acceleration.	K2	CO5	5M
	b)	A solid right circular drum of radius $r = 0.3\text{m}$ and weight $W = 143.3\text{N}$ is free to rotate about its geometric axis as shown in Fig. Wound around the circumference of the drum is a flexible cord carrying at its free end a weight $Q = 44.5\text{N}$. If the weight W is released from rest, (a) find the time t required for it to fall through the height $h = 3\text{m}$. (b) With what velocity v will it strike the floor?	K3	CO5	5M



OR

11.	a)	State and explain work-energy theorem.	K2	CO5	5M
	b)	A gun weighing 667.5kN fires a 4.45kN projectile with a muzzle velocity of 1080m/s . The gun is nested in springs having a total spring constant $k = 26700\text{kN/m}$. Assuming that the explosion is over before the gun has a chance to move perceptibly, how far will it recoil after the explosion.	K3	CO5	5M

