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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Second Semester, B.E. - Semester End Examination; August - 2023

Engineering Mechanics

(Common to All Branches)

Time: 3 hrs *Max. Marks: 100*

Course Outcomes

The Students will be able to:

CO1: Apply the knowledge of basic science and mathematics to classify the force systems and compute its resultant.

CO2: Analyse the system of forces in equilibrium with or without frictional forces.

CO3: Locate the Centroid and composite moment of inertia of irregular and built up sections.

CO4: Analyse the problems with respect to linear motion, curvilinear motion and energy.

Note: *I) **PART - A** is compulsory. **Two** marks for each question.*

*II) **PART - B**: Answer any **Two** sub questions (from a, b, c) for a Maximum of **18 marks** from each unit*

Q. No.	Questions	Marks	BLs	COs	POs
	I : PART - A	**10**			
1 a.	Define moment of force.	2	L1	CO1	PO1,2
b.	A cantilever beam of 3 m carries a point load of 6 kN at the center of the span. Find the reactions at the support.	2	L1	CO2	PO1,2
c.	Define friction. Write the relationship between angle of friction and co-efficient of friction.	2	L1	CO3	PO1,2,3
d.	Define radius of gyration.	2	L1	CO3	PO1,2,3
e.	A body moving with a velocity of 2 m/s. After 4 seconds the velocity of the body reaches 5 m/s. Find the acceleration of the body.	2	L1	CO4	PO1,2,3
	II : PART - B	**90**			
	UNIT - I	**18**			
2 a.	Define force and hence state and prove law of parallelogram of force.	9	L2	CO1	PO1,2
b.	Determine the magnitude, direction and position of the resultant for the force system shown in Fig. 2.1	9	L4	CO1	PO1,2

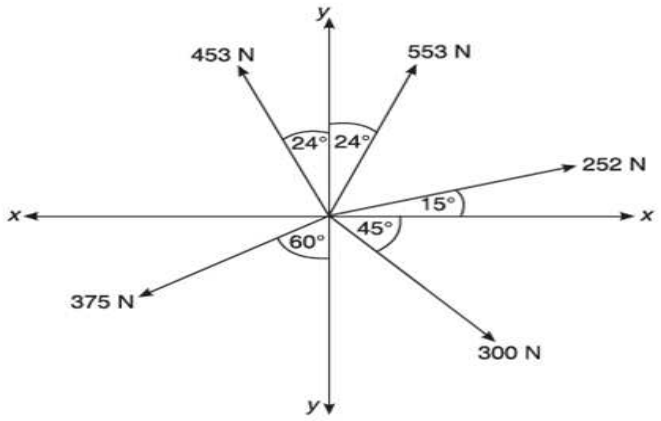

Fig. 2.1

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c. Two spheres each of 400 N weight are placed on inclined plane as shown in Fig. 2.2. Calculate the reactions at all the point of contact. 9 L4 CO1 PO1,2

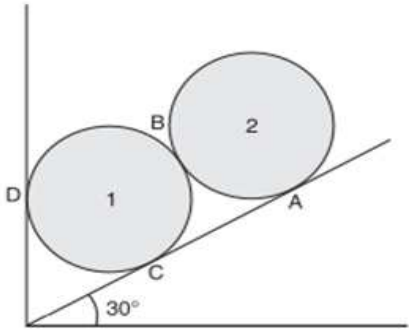

Fig 2.2

UNIT - II **18**

3 a. With neat sketch, explain different types of loads and supports. 9 L2 CO2 PO1,2

b. Determine the support reactions for the beam as shown in Fig. 3.1 9 L4 CO2 PO1,2

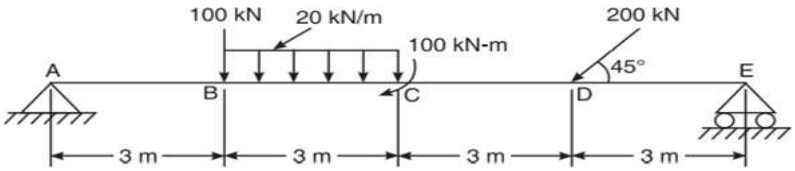

Fig 3.1

c. A small block of weight 1000 N as shown in figure, is placed on a 30° inclined plane as shown in Fig. 3.2 with μ = 0.25. Determine the horizontal force to be applied for:

(i) Impending motion down the plane

(ii) Impending motion up the plane 9 L4 CO2 PO1,2

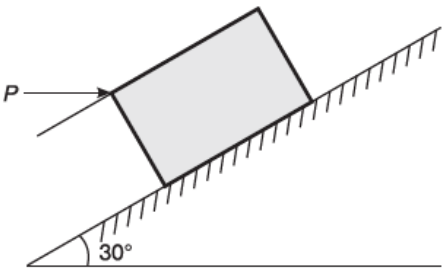

Fig 3.2

UNIT - III **18**

4 a. Derive the expression for centroid of a rectangle by using first principles. 9 L3 CO3 PO1,2,3

b. Determine centroid of the composite with respect to *x* and *y* axes as shown in Fig. 4.1. 9 L4 CO3 PO1,2,3

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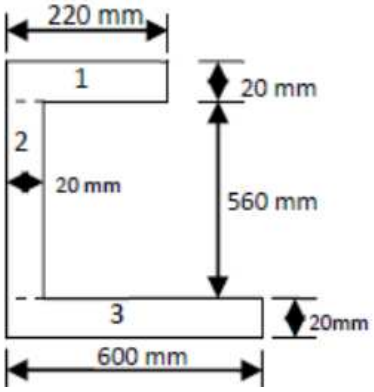
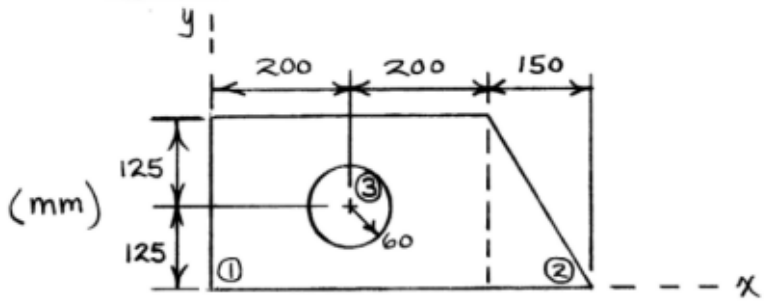


Fig 4.1

c. Locate the centroid for shaded portion with respect to x and y axes as shown in figure Fig. 4.2.



9 L4 CO3 PO1,2,3

Fig 4.2

UNIT - IV **18**

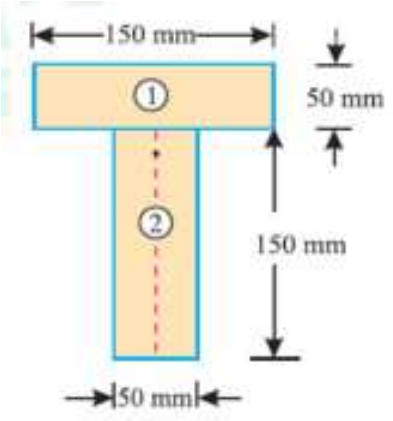
5 a. State and prove;

i) Parallel axis theorem 9 L3 CO3 PO1,2,3

ii) Perpendicular axis theorem

b. From first principle, determine moment of inertia of a quarter circles about its centroidal axis. 9 L3 CO3 PO1,2,3

c. Determine the moment of inertia about its centroidal axis for the section shown in figure.



9 L4 CO3 PO1,2,3

Fig 5.1

Contd…4

UNIT - V **18**

6 a.	Derive the expression for equation of motion.	9	L3	CO4 PO1,2,3
b.	A cricket ball throw from a height of 1.8 m above the ground level at an angle of 30º with the horizontal with velocity of 12 m/s and is caught by a fielder at a height 0.6 m above the ground. Determine the distance between 2 players.	9	L4	CO4 PO1,2,3
c.	A police officer observes a car approaching at the unlawful speed of 60 kmph. He gets on his motor cycle and starts chasing the car, just as it passes in front of him. After accelerating for 10 seconds, at a constant rate, the officer reaches his top speed of 75 kmph. How long does it take the officer to overtake the car from time he started?	9	L4	CO4 PO1,2,3

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