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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; July / Aug. - 2022

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.

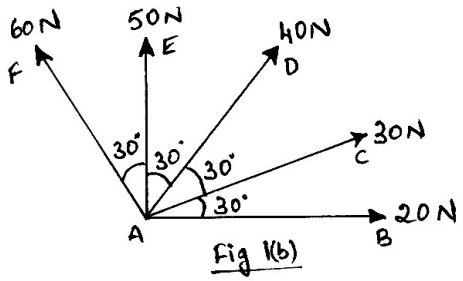
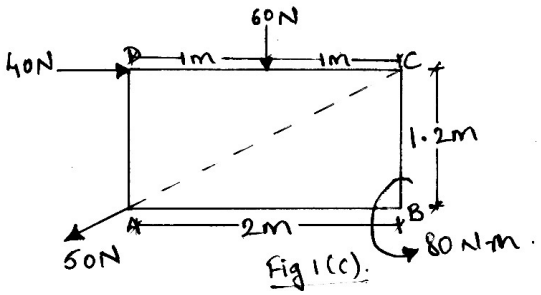
CO2: Analyze the system of forces in equilibrium with or without frictional forces.

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

CO4: Analyze 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**			
I a.	Define force. Write any four characteristics of force.	2	L1	CO1	PO1
b.	Explain cone of friction with neat sketch.	2	L2	CO2	PO1
c.	Differentiate between Centroid and Centre of gravity.	2	L2	CO3	PO1
d.	With neat sketch, give the expression to calculate moment of inertia of a hollow rectangular reaction.	2	L1	CO3	PO2
e.	Explain superelevation.	2	L2	CO4	PO1
	II : PART - B	**90**			
	UNIT - I	**18**			
1 a.	Explain moment of a force and hence state and prove Varignons's principle of moment for concurrent forces.	9	L2	CO2	PO1
b.	Find the resultant and its direction for the forces shown in Fig. 1(b).  Fig 1(b)	9	L1	CO1	PO1
c.	Determine the Magnitude, direction and point of application of the resultant force for the given system of force as shown in Fig. 1(c).  Fig 1(c).	9	L3	CO2	PO2

Contd… 2

UNIT - II **18**

2 a. i) List and explain different types of loads that are commonly applied on beams with their reduced concentrated loads. 9 L2 CO2 PO2

ii) State the laws of static friction.

b. Determine the support reactions for the beam supported and loaded as shown in Fig. 2(b).

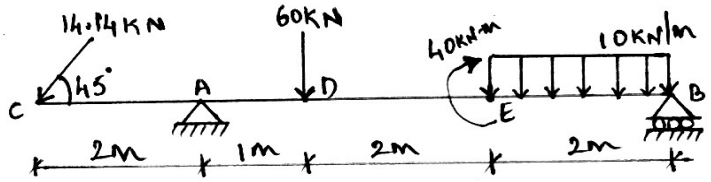


Fig 2(b)

9 L3 CO2 PO2

c. A block of mass 20 kg placed on an inclined plane as shown in Fig. 2(c) is subjected to a force 'p' parallel to the plane. The coefficient of friction is 0.24. Determine the value of 'p' for impending motion of the black ($g = 9.81\ m/s^2$)

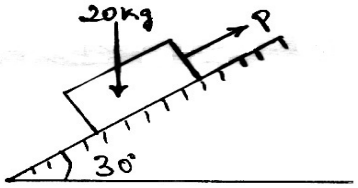


Fig 2(c).

9 L3 CO2 PO2

UNIT - III **18**

3 a. Determine the Centroid of right angled triangle from first principles. 9 L3 CO3 PO1

b. Find the Centroid of the shaded portion for the figure shown in Fig. 3(b).

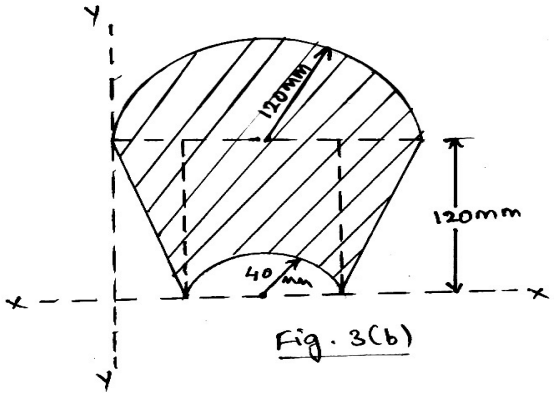
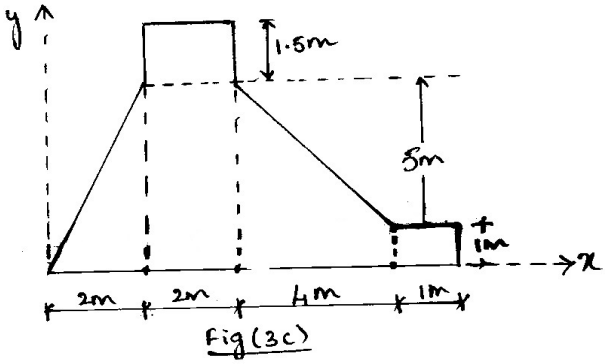


Fig. 3(b)

9 L3 CO3 PO2

c. Determine the Centroid for the figure shown in Fig. 3(c).



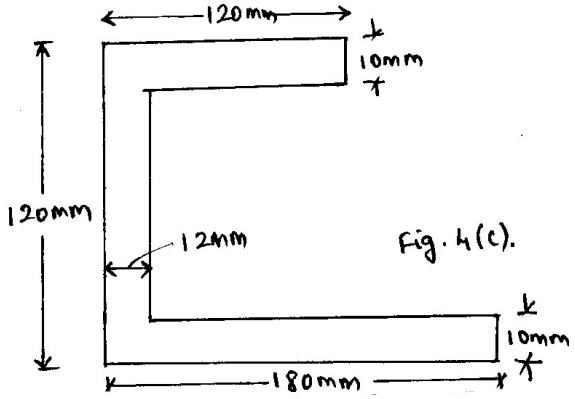
Fig(3c)

9 L3 CO3 PO2

Contd... 3

UNIT - IV **18**

4 a.	State and prove: i) Parallel axis theorem ii) Perpendicular axis theorem	9	L3	CO3 PO2
b.	From first principles, derive the moment of inertia of a triangle about its base and the centroidal *y*–axis.	9	L2	CO3 PO3
c.	Determine the moment of inertia of the section shown in Fig. 4(c). Also calculate least radius of gyration.	9	L3	CO3 PO3



UNIT - V **18**

5 a.	Derive the three equations of motion of a body in straight line under uniform acceleration.	9	L3	CO4 PO2
b.	A stone is dropped into a well is heard to strike the water after 4 seconds. Find the depth of well, if the velocity of sound is 350 m/s.	9	L2	CO4 PO2
c.	A pile hammer weighing 2500 N falls on a pile. If the hammer drops freely from a height of 5 meters, find the impulsive force of the blow, if the hammer comes to rest in 1/100 seconds. Take g = 9.81 m/s^2.	9	L2	CO4 PO2

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