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

(An Autonomous Institution affiliated to VTU, Belagavi)

First Semester, B.E. - Semester End Examination; May - 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.

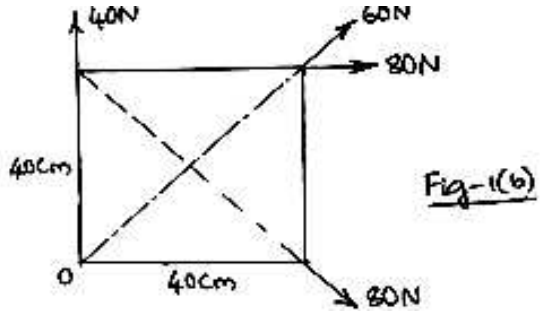
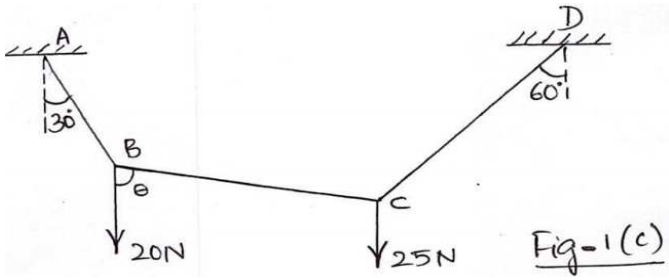
CO2: Analyse the system of forces in equilibrium with or without frictional forces.

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**			
I	a.	With an example, explain resolution of forces.	2	L2	CO1	PO1
	b.	Define statically determinate beams and give examples.	2	L3	CO2	PO1
	c.	Differentiate between centroid and centre of gravity.	2	L2	CO3	PO1
	d.	Define the terms: i) Radius of gyration, ii) Polar moment of inertia.	2	L2	CO3	PO1
	e.	Define the terms: i) Projectiles velocity, ii) Super elevation.	2	L1	CO4	PO1
		II : PART - B	**90**			
		UNIT - I	**18**			
1	a.	Define moment of a force and force. List the characteristics of force.	9	L2	CO2	PO1
	b.	Determine the resultant of the system of forces acting on a lamina shown in Fig.1(b). Locate its '*x*' intercept from '*O*'  Fig-1(b)	9	L3	CO2	PO1
	c.	Determine angle θ for the system of strings ABCD in equilibrium as shown in Fig.1(c)  Fig-1(c)	9	L3	CO2	PO1

Contd... 2

UNIT - II **18**

2 a.	With a neat sketch, describe the different types of supports.	9	L2	CO2	PO1
b.	Determine whether the 50 kg block shown in Fig.2(b) is in equilibrium and find the magnitude and direction of the frictional force when; (i) P = 100 N, (ii) P = 200 N, take $\mu_s = 0.3$ and $\mu_k = 0.2$.	9	L3	CO2	PO1

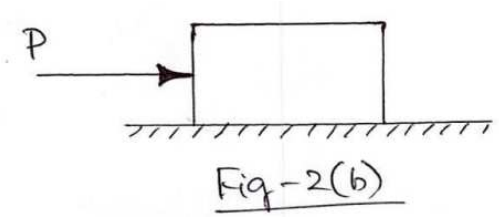


Fig-2(b)

c.	Find the support reactions shown in beam shown in Fig. 2(c).	9	L3	CO2	PO2

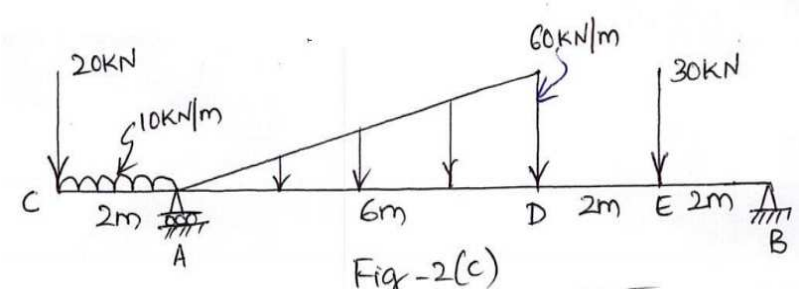


Fig-2(c)

UNIT - III **18**

3 a.	Using method of integration, determine the *x* and *y* coordinates of centroid of rectangle.	9	L3	CO3	PO2
b.	Locate the centroid of the area shown in Fig.3 (b). All dimensions are in mm.	9	L3	CO3	PO3

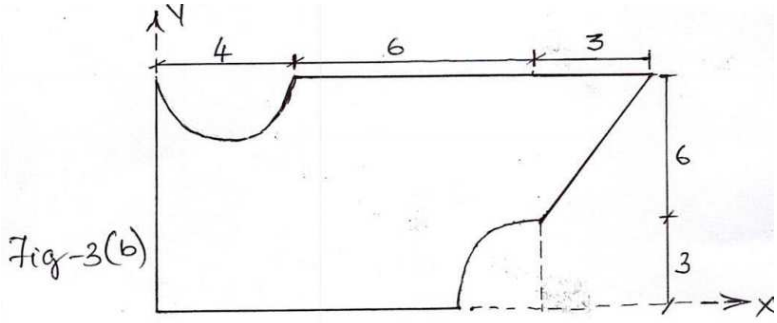


Fig-3(b)

c.	Locate centroid with respect to '*O*' for the lamina shown in Fig. 3(c).	9	L3	CO3	PO3

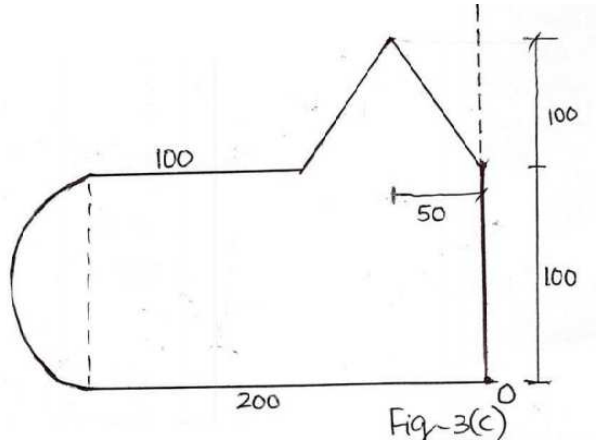


Fig-3(c)

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UNIT - IV **18**

4 a.	State and prove perpendicular axis theorem.	9	L2	CO3	PO3
b.	Find the polar radius of gyration for the area shown in Fig. 4(b). All dimensions are in mm.	9	L3	CO3	PO3

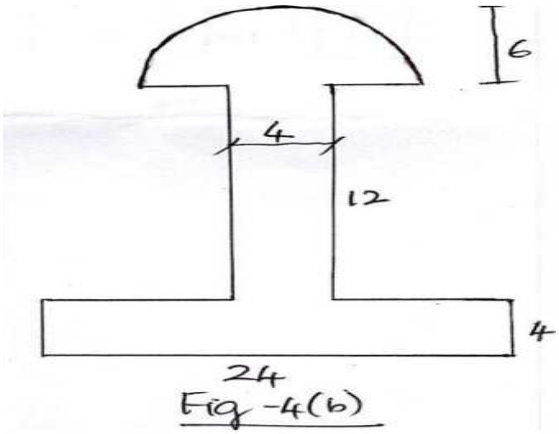

Fig -4(b)

c.	Determine the second moment of the area about the horizontal centroidal axis as shown in Fig. 4(c). Also find radius of gyration. All dimensions are in mm.	9	L3	CO3	PO3

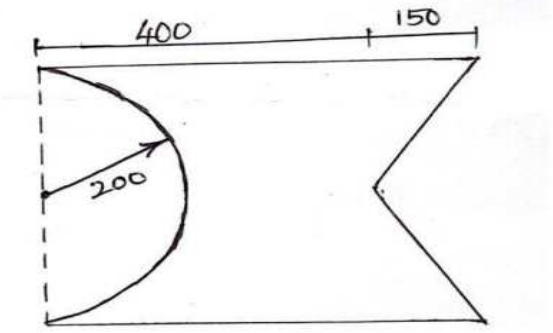

Fig - 4(c)

UNIT - V **18**

5 a.	A stone is dropped from the top of the tower 50 m high. At the same time another stone is thrown up from the tower with a velocity of 25 m/s. At what distance from the top and after how much time the two stones cross each other?	9	L1	CO4	PO3
b.	A projectile is projected from a point at an angle of elevation of 30° with a velocity of 600 m/s. Find the velocity of motion of the particle at the end of, i) 25 seconds and ii) 40 seconds.	9	L3	CO4	PO3
c.	Calculate the super elevation of the rail on a curved track for a locomotive running at 60 kmph, gauge and radius of curvature being 1.68 m and 800 m respectively. Find the lateral thrust exerted on the outer rail, if the speed of the locomotive is changed to 80 kmph, weight of locomotive is 1000 kN.	9	L4	CO4	PO3

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