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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; Sep. / Oct. - 2023

Engineering Mechanics

(Civil Engineering Stream)

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, Compute its resultant and Analyze the trusses.

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

CO3: Identify the centroid and composite 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**			
1 a.	Explain principle of transmissibility of force.	2	L2	CO1	PO1
b.	Explain angle of friction.	2	L1	CO2	PO1
c.	State any four assumptions made in the analysis of statically determinate truss.	2	L1	CO2	PO1
d.	Determine the least radius of gyration for an unsymmetrical *C* section having an area of 3500 mm^2 and moment of inertia $6.856x10^6$ mm^4 and $10.717x10^6$ mm^4 in *x* and *y* direction respectively	2	L3	CO3	PO3
e.	Discuss the concept 'super elevation'.	2	L2	CO4	PO3
	II : PART - B	**90**			
	UNIT - I	**18**			
2 a.	State and prove Varignon's theorem of moments.	9	L3	CO1	PO 1
b.	Determine the resultant of the force system shown in Fig. 2b.	9	L4	CO1	PO1

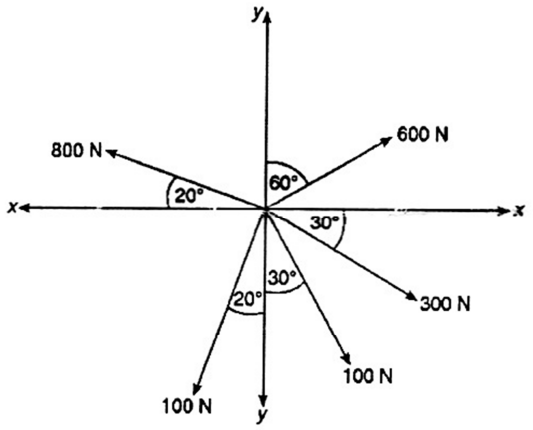


Fig. 2b

c. Evaluate the magnitude, direction and position of the resultant force with reference to *A* for the force system shown in Fig. 2c. 9 L4 CO2 PO1

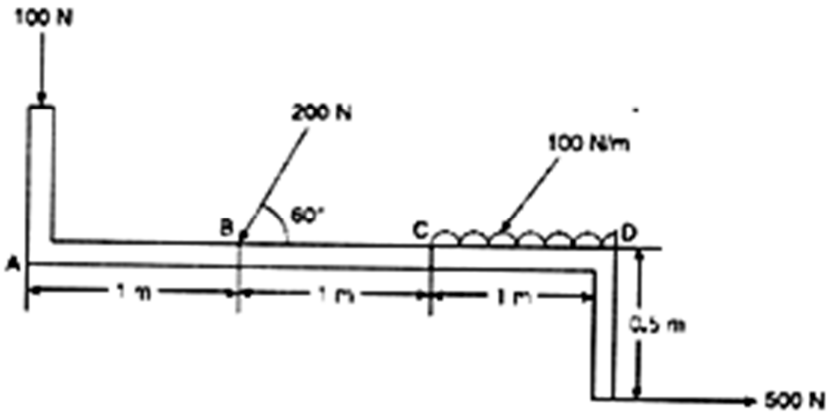


Fig. 2c

UNIT - II **18**

3 a. List and explain briefly: 9 L2 CO2 PO1

i) Types of beams ii) Types of supports iii) Types of loadings

b. Determine the support reaction for the cantilever shown in Fig. 3b. 9 L4 CO2 PO2

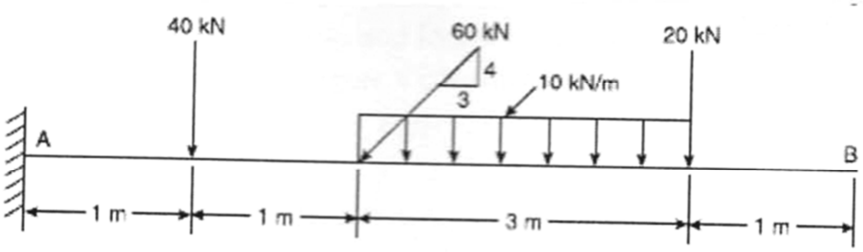


Fig. 3b

c. Calculate the value of 'W' required in Fig. 3c. 9 L4 CO2 PO2

i) To cause the body to move in the upward direction

ii) To cause the body to move in the downward direction

Take $\mu = 0.3$

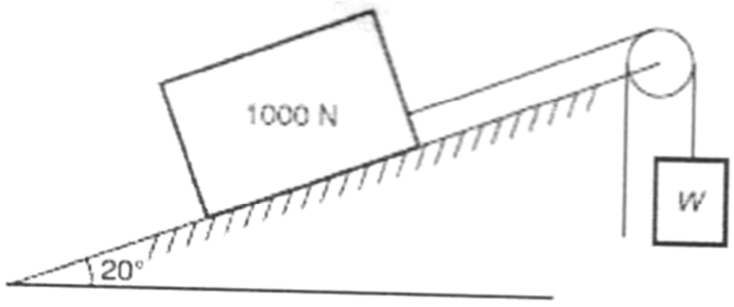
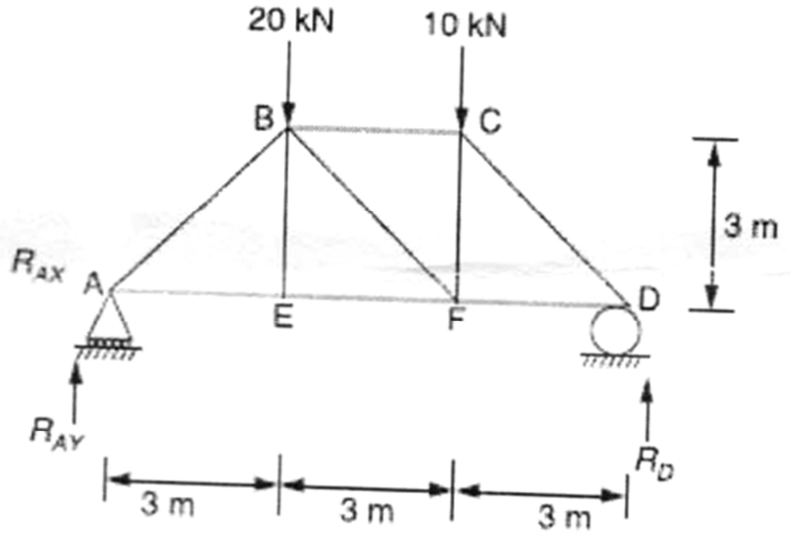


Fig. 3c

UNIT - III **18**

4 a. Briefly explain the method of joints and method of sections in the analysis of plane trusses. 9 L2 CO2 PO2

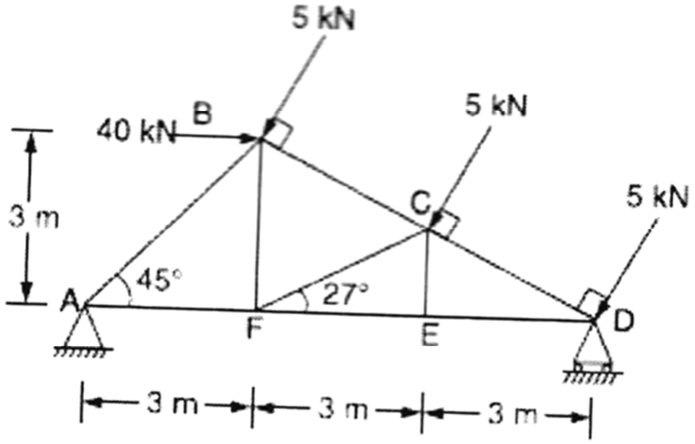
b. Analyze the truss shown in Fig. 4b by the method of joints. Tabulate the result and indicate the nature of force in the truss.



9 L4 CO2 PO3

Fig. 4b

c. Evaluate the support reactions and forces in the members BC, CF, EF and CE of truss as shown in Fig. 4c, by method of sections.



9 L4 CO2 PO3

Fig. 4c

UNIT - IV **18**

5 a. Develop the expression for centroid of a semicircle from first principle. 9 L3 CO3 PO3

Contd…4

b. Determine the centroid of the shaded area shown in Fig. 5b.

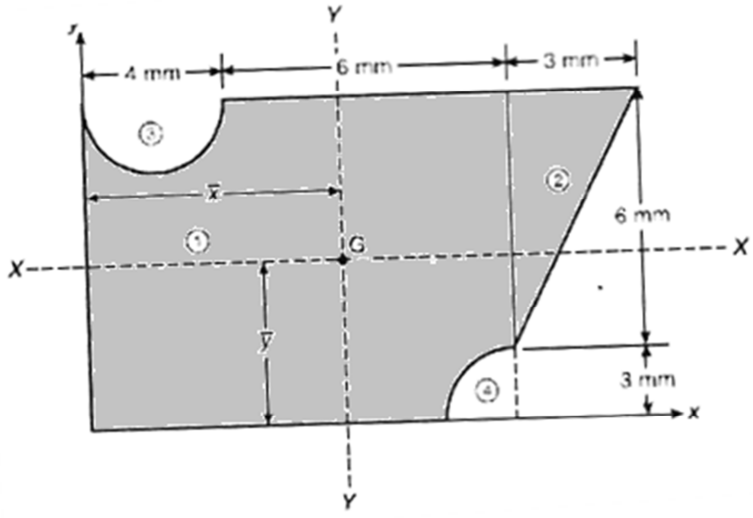


Fig. 5b

9 L4 CO3 PO3

c. Determine the moment of inertia of the section, shown in Fig. 5c about its centroid axes.

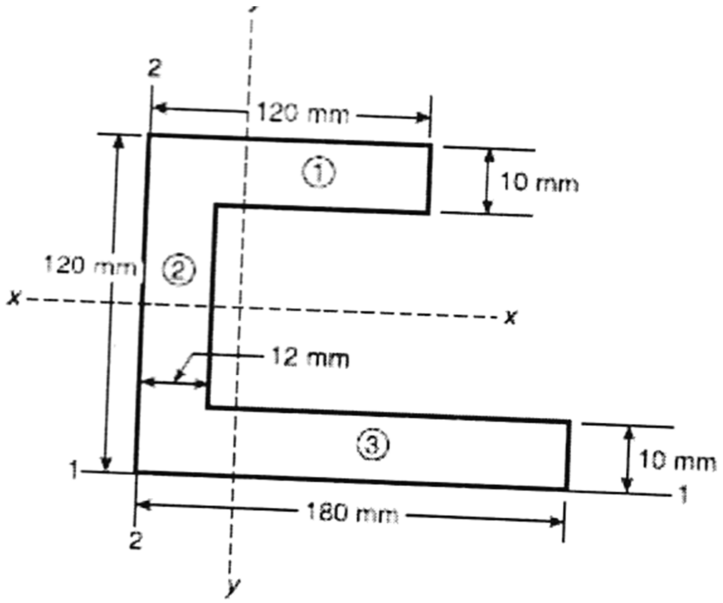


Fig. 5c

9 L4 CO3 PO3

UNIT - V **18**

6 a. Define projectile and hence with neat sketch, explain the various terms associated with projectile. 9 L2 CO4 PO3

b. Explain centrifugal force and hence find the angle of banking so that the vehicle can negotiate the curve without slipping travelling with a speed of 120 kmph in a curvilinear track of radius 250 m. 9 L4 CO4 PO3

c. Briefly explain work, power and energy. 9 L2 CO4 PO3

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