

Faculty of Engineering & Technology

Second Semester B.E. (C.B.S.) Examination

ENGINEERING MECHANICS

Paper—IV

Time—Two Hours]

[Maximum Marks—40

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INSTRUCTIONS TO CANDIDATES

- (1) All questions carry marks as indicated.
 - (2) Due credit will be given to neatness and adequate dimensions.
 - (3) Assume suitable data wherever necessary.
 - (4) Illustrate your answers wherever necessary with the help of neat sketches.
1. (a) Define Couple. State its characteristics. 3
 - (b) The force system shown in Fig. 1(b) produce a resultant of 600 N acting up to the right at an

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angle of 60° with x-axis. Find the values of F and θ to produce the resultant. 7

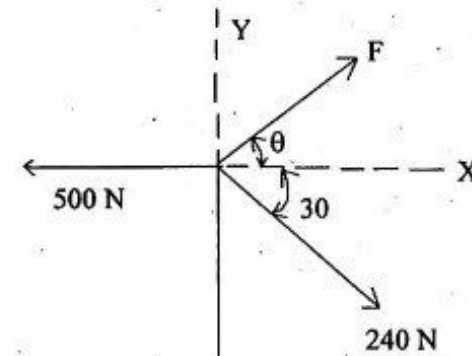


Fig. 1(b)

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2. (a) Two forces are acting on a bracket as shown in Fig. 2(a). Reduce the force system into a resultant force and a couple at point A. 5

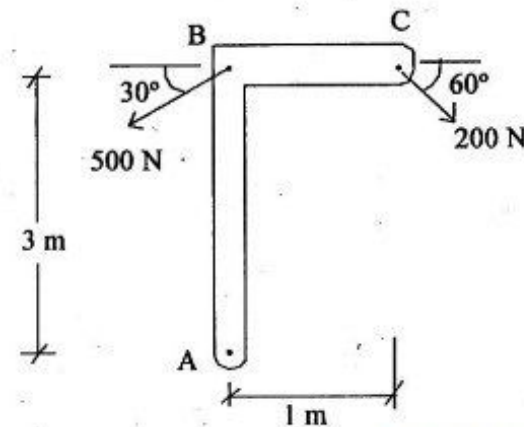


Fig. 2(a)

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- (b) Determine the resultant of two concurrent forces having the following magnitudes and passing through the origin and indicated points :

$$P = 140 \text{ N}, (3, -6, 2)$$

$$T = 260 \text{ N}, (-12, 4, -3)$$

Also find angles of the resultant with reference axes.

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3. (a) Define Free Body Diagram. State its significance with example.

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- (b) Bar AB of negligible weight is subjected to a vertical force of 600 N and a horizontal force of 300 N applied as shown in Fig. 3(b). Find angle ' θ ', with horizontal, at which equilibrium exists. Assume inclined surfaces as smooth.

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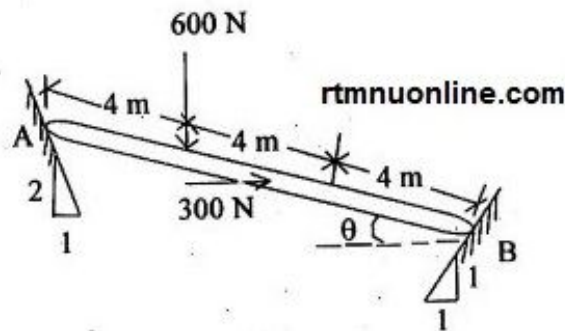


Fig. 3(b)

OR

4. (a) Classify the trusses. 3
(b) Find the forces in all the members of a truss as shown in Fig. 4(b). 7

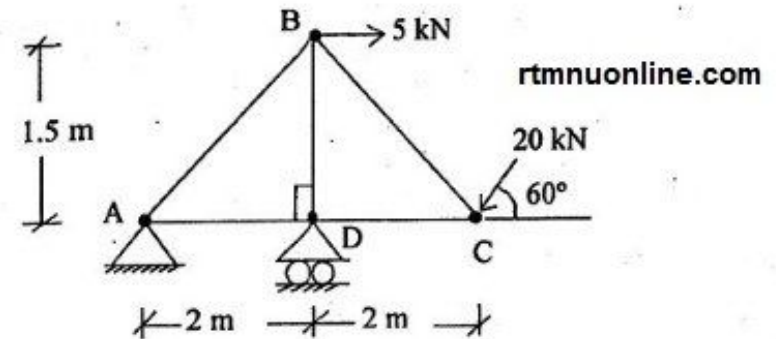


Fig. 4(b)

5. (a) Locate the centroid of the shaded area as shown in Fig. 5(a).

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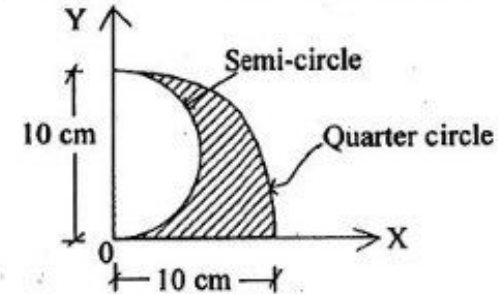


Fig. 5(a)

- (b) A simply supported beam of span 10 m carries point loads of 5 kN, 2 kN, 10 kN and 15 kN at 2 m, 3 m, 5 m and 9 m from left hand support. Find reactions at supports using principle of virtual work.

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OR

6. (a) Find moment of inertia of the plane lamina in Fig. 6(a) about the X and Y axes as shown. 5

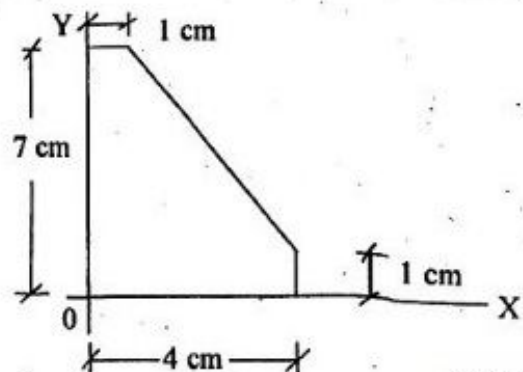


Fig. 6(a)

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- (b) Find the reaction at the support D, using principle of virtual work. 5

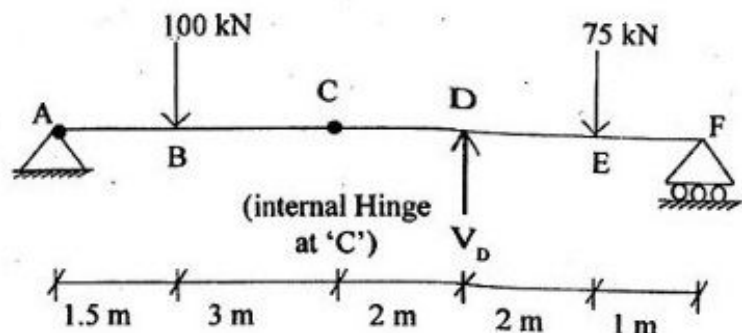


Fig. 6(b)

7. (a) What is dynamic equilibrium? 3

- (b) Two blocks as shown in Fig. 7(b) start from rest. The coefficient of kinetic friction between the horizontal plane and the block 'A' is 0.25. Assume

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the pulleys to be smooth and of negligible mass. Find the acceleration of each block and tension in the cords. Weight of block 'A' is 500 N and that of B is 1500 N. rtmnuonline.com 7

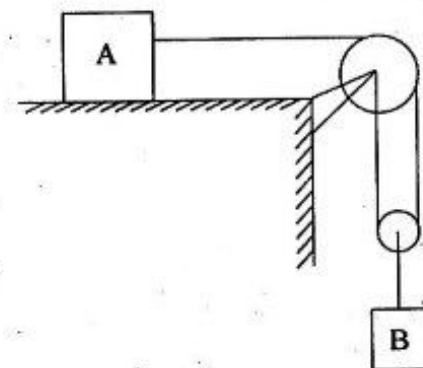


Fig. 7(b)

OR

8. (a) Define the following terms :

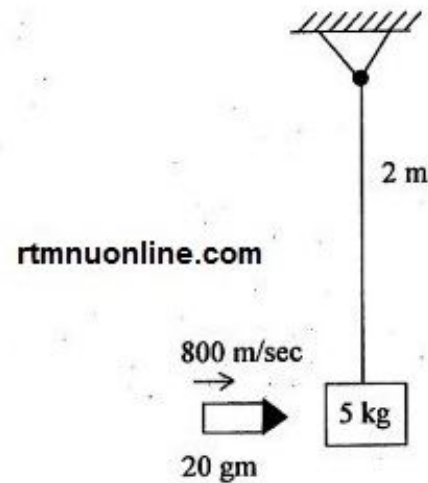
- Work rtmnuonline.com
- Direct Central Impact
- Coefficient of restitution. 3

- (b) A bullet of 20 gm moving horizontally with a velocity of 800 m/s strikes a block of wood of mass 5 kg through its centre. The block is suspended by a vertical wire from a point 2 m

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above its center. To what angle, with the vertical, will the block and the embedded bullet will swing ?

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**Fig. 8(b)**