



RM-6019

B. E. - I (Sem. I & II) (All) Examination

May / June - 2010

Engineering Mechanics

Time : 3 Hours]

[Total Marks : 100

Instructions :

(1)

नीचे दशांशवले निशानीवाणी विगतो उत्तरवडी पर अवश्य लखवी. Fillup strictly the details of signs on your answer book.	Seat No. :
Name of the Examination :	<input type="text"/>
B. E. - 1 (Sem. 1 & 2) (All)	<input type="text"/>
Name of the Subject :	<input type="text"/>
Engineering Mechanics	<input type="text"/>
Subject Code No. : <input type="text" value="6"/> <input type="text" value="0"/> <input type="text" value="1"/> <input type="text" value="9"/>	<input type="text"/>
Section No. (1, 2,.....) : <input type="text" value="1&2"/>	
Student's Signature	

- (2) Answers to the two sections must be written in two **separate** answer books.
- (3) Figures to the **right** indicate full marks.
- (4) Use of non-programmable calculator is permitted.
- (5) Assume suitable data, if required.
- (6) Justify your answer with suitable diagram.

SECTION - I

- 1 (a) Answer the following questions briefly (any five) 10
- (i) Define statics and dynamics.
 - (ii) Define particle and rigid body.
 - (iii) Hinge, Roller and fixed supports.
 - (iv) Angle of repose.
 - (v) Assumptions in the analysis of truss.
 - (vi) Coplanar and concurrent forces.
 - (vii) Law of polygon.
 - (viii) Law of parallelogram of forces.

- (b) A force system shown in Fig. 1. Determine the magnitude and direction of the resultant force :

8

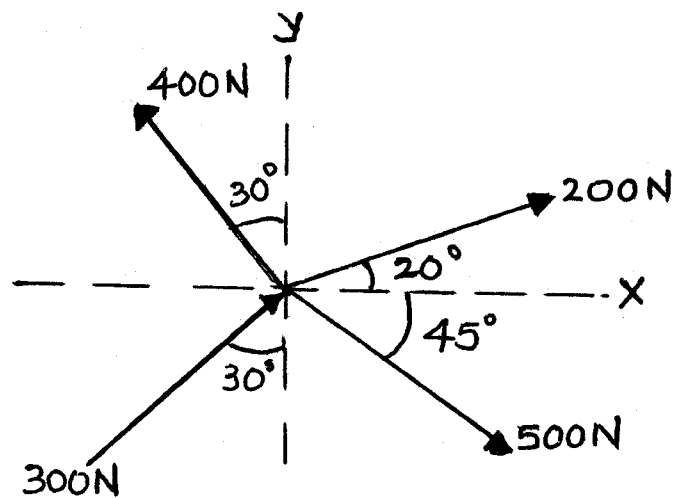


Fig. 1

OR

- (b) Determine forces in member AC and BC for the given Fig. 2.

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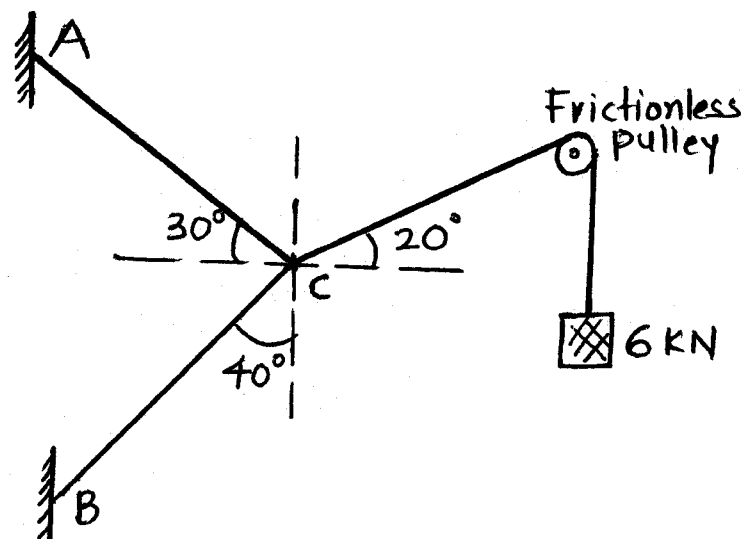


Fig. 2

- 2 (a) Replace the force couple system shown in Fig. 3 by a single force and couple moment at point A. 8

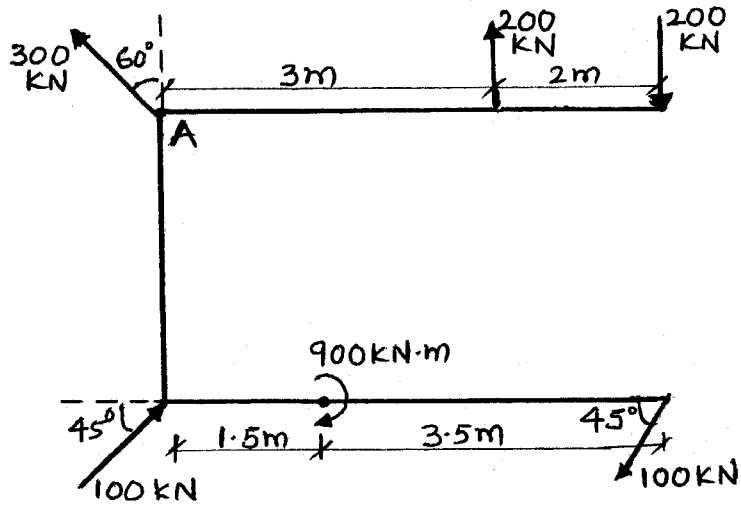


Fig. 3

- (b) Attempt any two : 14
- (i) Determine reactions at supports A, and B of the beam shown in Fig. 4.

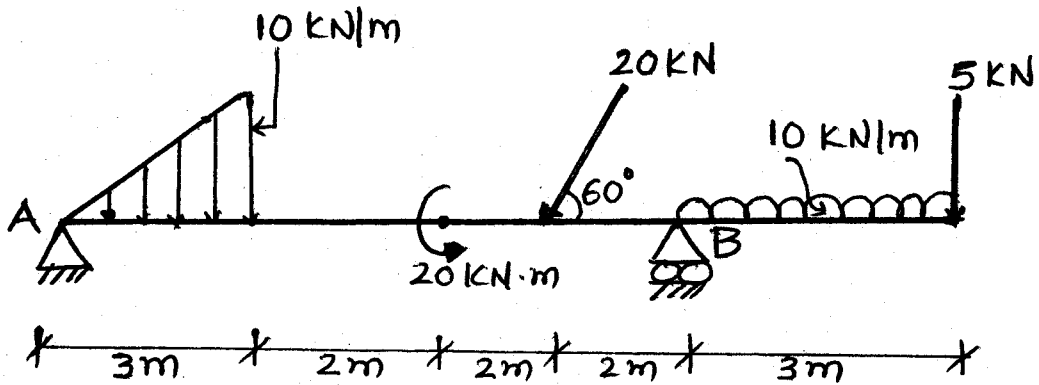


Fig. 4

- (ii) A body A of weight 10 kN is to be raised by means of 15° wedge B by a Horizontal force P as shown in Fig. 5. The weight is constrained to move vertical by the application of horizontal force Q. Determine the magnitude of P and Q. ($\mu_s = 0.25$ at all the contact surfaces)

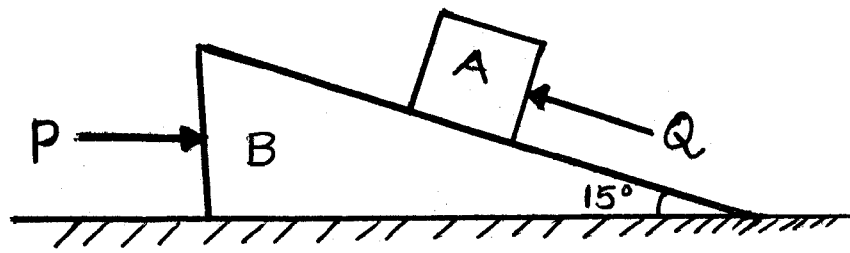


Fig. 5

- (iii) Determine the tensions in the cable due to loads shown in Fig. 6. Also determine Y_C and Y_D . (Reactions at the supports are not needed).

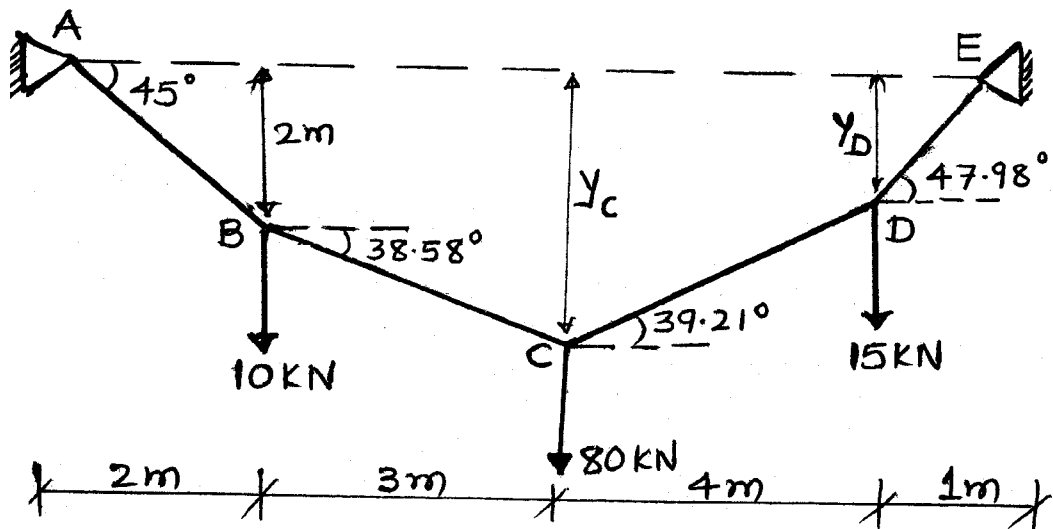


Fig. 6

- 3 A plane truss and forces acting on it is shown in Fig. 7. Determine stability check, reactions at supports, forces in each members.

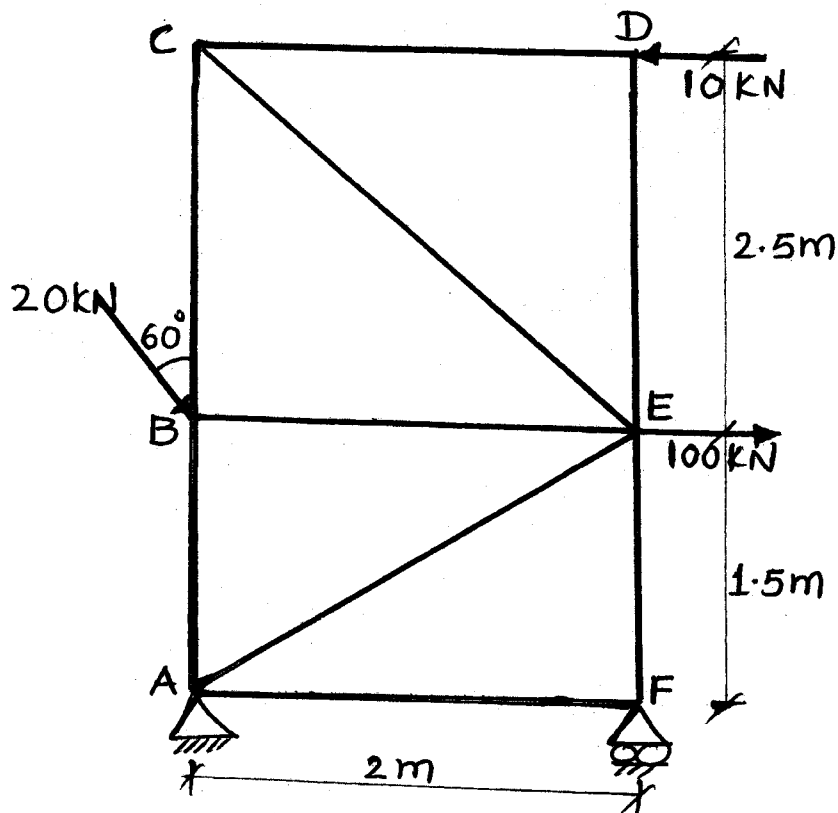


Fig. 7

SECTION - II

- 4 (a) Fill in the blanks : (any five) 5
- (i) Centroid relates to _____ of line or curve _____ of surface and _____ of a body.
 - (ii) Acceleration is the rate of _____ of velocity.
 - (iii) The path travelled by a particle in air is _____.
 - (iv) _____ may be defined as the capacity of doing work.
- (b) Answer the following : (any two) 5
- (i) Explain dynamic equilibrium.
 - (ii) State and explain perpendicular axis theorem.
 - (iii) State Pappus-Guldinus theorem.
 - (iv) Explain D'Alembert's principle.

- 5 (a) Locate the centroid of the shaded lamina as shown in Fig. 8 : 8

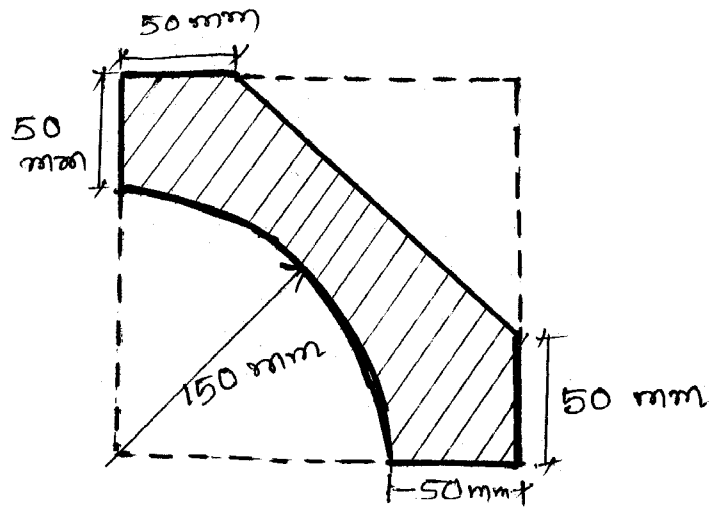


Fig. 8

OR

- 5 (a) Determine the location of centroidal I_{xx} and I_{yy} of lamina shown in Fig. 9. 8

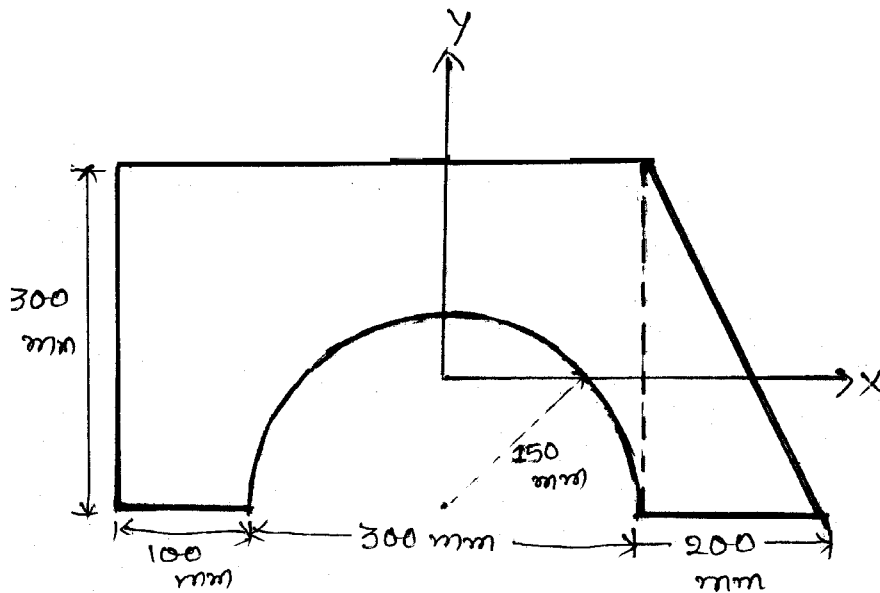


Fig. 9

- (b) From Fig. 10 a cylinder having 100 mm as base and 300 mm as height an inverted cone with same base and height is cut off. Calculate the C.G. of remaining solid with respect to base. 8

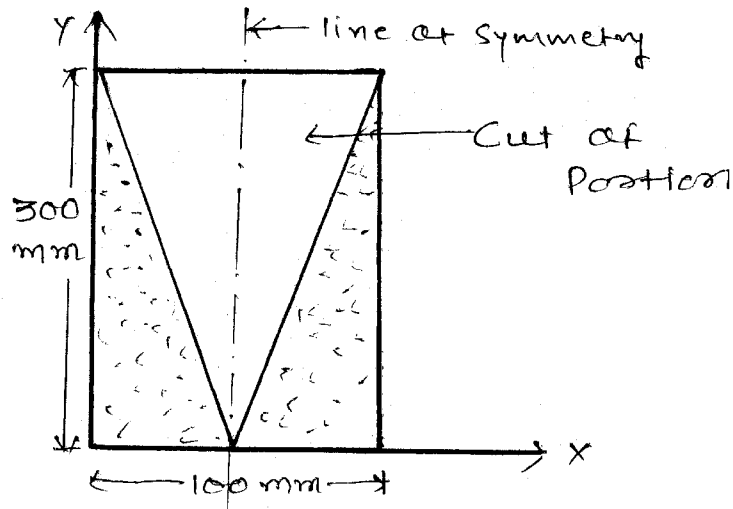


Fig. 10

- 6 (a) Attempt any two : 16
- (i) Find the height of a tower from the top of which an object falls freely and during the last second of its motion, the object travels a distance equal to $\frac{2}{3}$ of the height of the tower. Taking $g = 9.8 \text{ m/s}^2$.
 - (ii) A horizontal tunnel is 6m high. A particle is projected inside the tunnel with a velocity of 50 m/s. Determine :
 - (a) the angle of projection
 - (b) the greatest possible range.
 - (iii) A train is travelling with a speed of 60 km/hr. A passenger in the train throws a stone with a speed of 40 km/hr. Making an angle 90° with the direction of motion of a train. Find the resultant velocity of the stone and its direction of motion with respect to train direction. When $\alpha = 60^\circ$ (Angle between direction at stone and train).

- (b) Determine the tension in the strings and acceleration of blocks A and B weighing 150 N and 50 N connected by a string and frictionless and weightless pulley as shown in Fig. 11.

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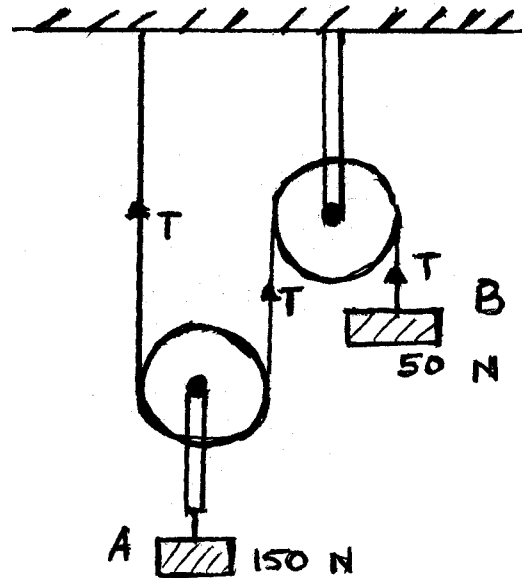


Fig. 11