

22203

24225

3 Hours / 70 Marks

Seat No.

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- Instructions* – (1) All Questions are *Compulsory*.
(2) Answer each next main Question on a new page.
(3) Illustrate your answers with neat sketches wherever necessary.
(4) Figures to the right indicate full marks.
(5) Assume suitable data, if necessary.
(6) Use of Non-programmable Electronic Pocket Calculator is permissible.
(7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

- 1. Attempt any FIVE of the following :** **10**
- a) State characteristics of force.
 - b) Define self locking machine and state the condition for it.
 - c) State law of polygon of forces.
 - d) Write analytical condition of equilibrium for concurrent force system.
 - e) Define coefficient of friction.
 - f) Define centre of gravity and centroid.
 - g) State two properties of couple.

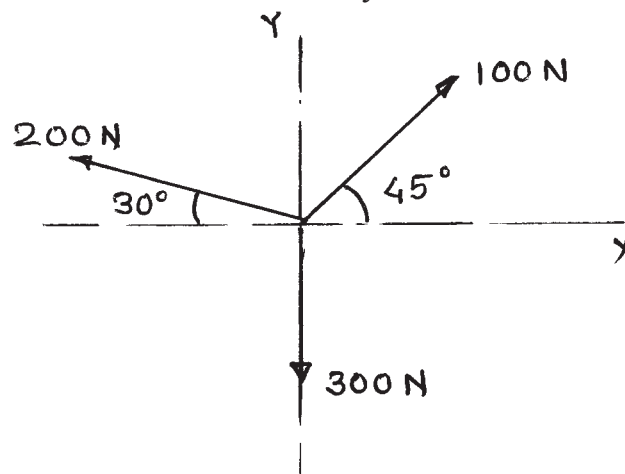
P.T.O.

2. Attempt any THREE of the following :**12**

- a) Define unlike parallel force system and concurrent force system with sketch.
- b) Certain machine follows the law $P = (0.02 W + 14) \text{ N}$. When the load is lifted by 2 cm, the effort has to move 150 cm. State with reason, whether the machine is reversible or not.
- c) State law of machine and explain its significance.
- d) Draw FBD of ladder in friction and list all forces in it.

3. Attempt any THREE of the following :**12**

- a) Calculate resultant of a force system shown in Fig. No. 1

**Fig. No. 1**

- b) Find the angle between two equal forces of magnitude 300 N each, if their resultant is 150 N.
- c) A screw jack having 5 mm pitch and has 300 mm as diameter of effort wheel is used to lift a load of 80 kN. Find V.R. and effort required if efficiency of machine is 40%.
- d) A machine has V.R. of 250 and has its law $P = (0.01 W + 5) \text{ N}$. Find M.A., efficiency, effort lost in friction at a load of 1000 N and also state whether machine is reversible or not.

4. Attempt any THREE of the following :

12

- a) Calculate moment of all forces about point 'A' for the force system as shown in Fig. No. 2.

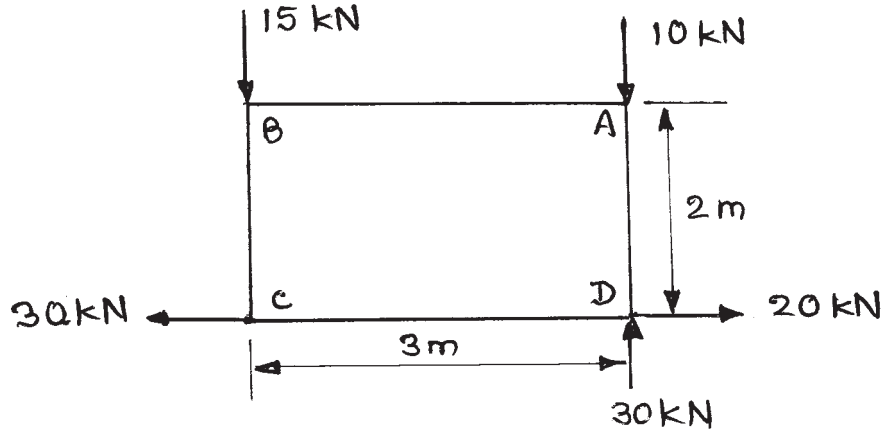


Fig. No. 2

- b) Calculate the reactions offered by planes. Refer Fig. No. 3.
Sphere weighs 500 N.

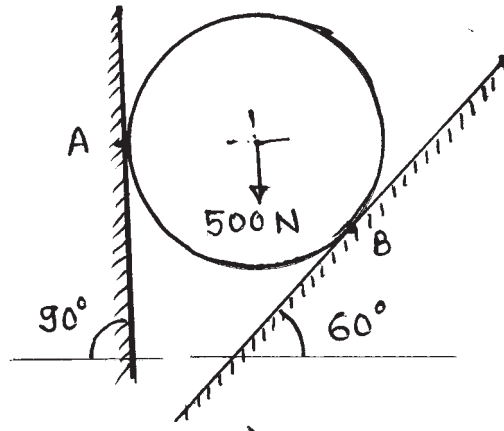


Fig. No. 3

- c) Calculate graphically the reactions of a beam loaded and supported as shown in Fig. No. 4.

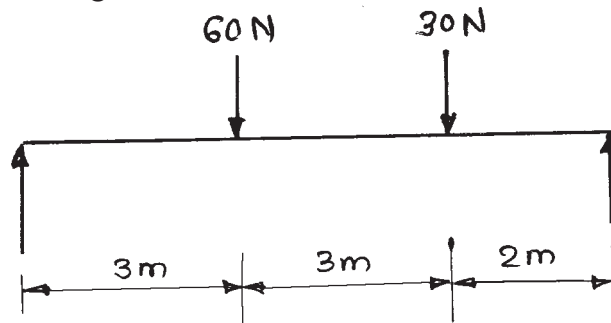


Fig. No. 4

- d) A body weighing 350 kN is resting on a horizontal plane and can be just moved by a force of 125 kN applied horizontally. Find coefficient of friction. Also find magnitude and direction of resultant reaction.
- e) A simply supported beam having point loads of 600N and 800N at a distance of 2 m and 5 m from left hand support respectively. Calculate support reactions.

5. Attempt any TWO of the following :

12

- a) Calculate the reactions of beam loaded and supported as shown in Fig. No. 5 by analytical method.

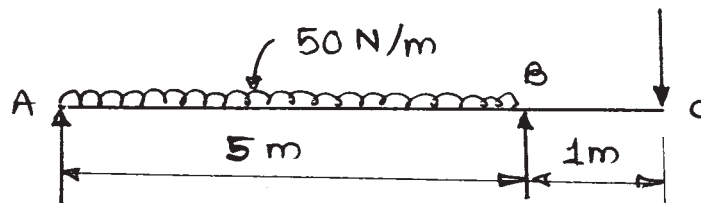


Fig. No. 5

- b) A block is resting on a rough inclined plane whose inclination to the horizontal is 15° . the force of 11N applied parallel to the plane on which block is resting will just move it down. If the coefficient of friction between the block and the plane is 0.40, estimate the weight of the block.

- c) Calculate the resultant and locate it's position w.r.t. point A for the force system shown in Fig. No. 6.

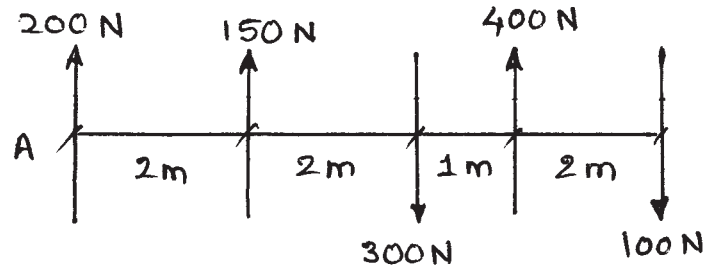


Fig. No. 6

6. Attempt any TWO of the following :

12

- a) Find position of centroid for T-Section shown in Fig. No. 7.

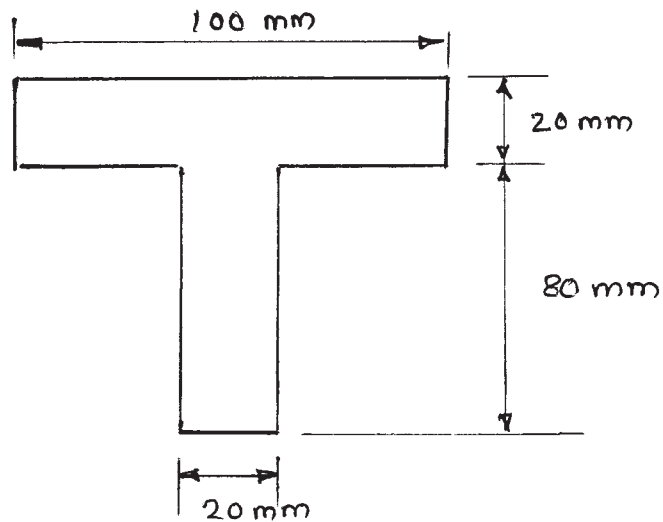


Fig. No. 7

- b) Locate the centroid of a shaded portion of a lamina as shown in Fig. No. 8.

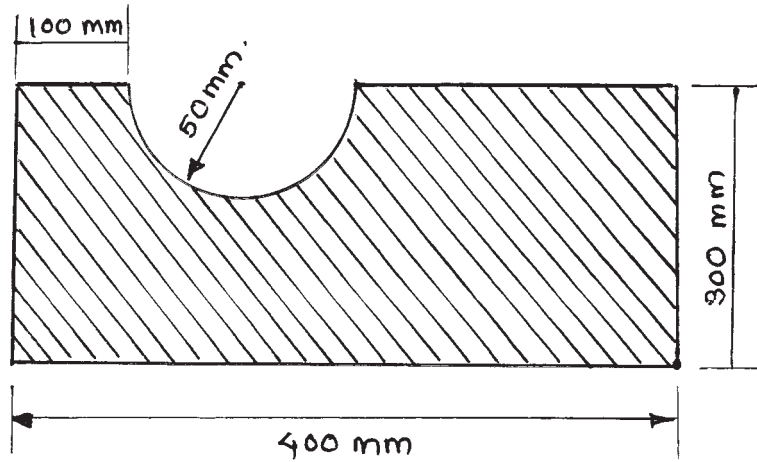


Fig. No. 8

- c) Calculate centre of gravity of frustum of solid circular cone as shown in Fig. No. 9 w.r.t. bottom.

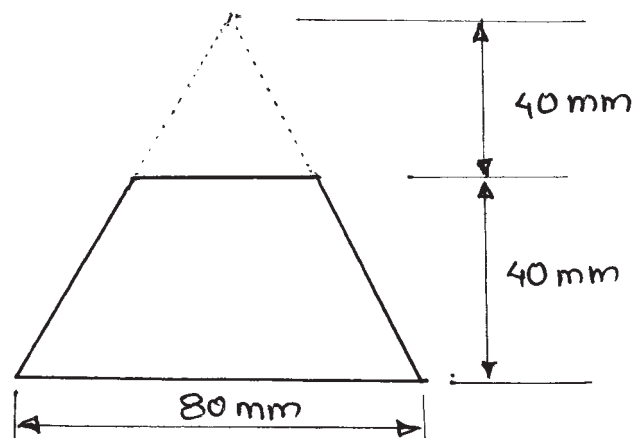


Fig. No. 9