

# 22203

**21819**

**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. Define Statics and Dynamics.
  - b. State ideal machine and write its any two characteristics.
  - c. State law of parallelogram of forces.
  - d. State Lami's theorem.
  - e. Define coefficient of friction.
  - f. Define centroid and centre of gravity
  - g. Write analytical conditions of equilibrium for concurrent force system.
  - h. Define force and state its S.I unit.

P.T.O.

2. Attempt any THREE of the following: 12

- a) Write classification of force system and explain any one in detail.
- b) Calculate effort lost in friction and load lost in friction, if machine lifts a load of 100 N by an effort of 8 N at an efficiency of 60%.
- c) Explain law of machine. State its use.
- d) Draw FBD of ladder in friction.

3. Attempt any THREE of the following: 12

- a) Calculate the magnitude and direction of resultant for concurrent force system as shown in Fig. No. 1.

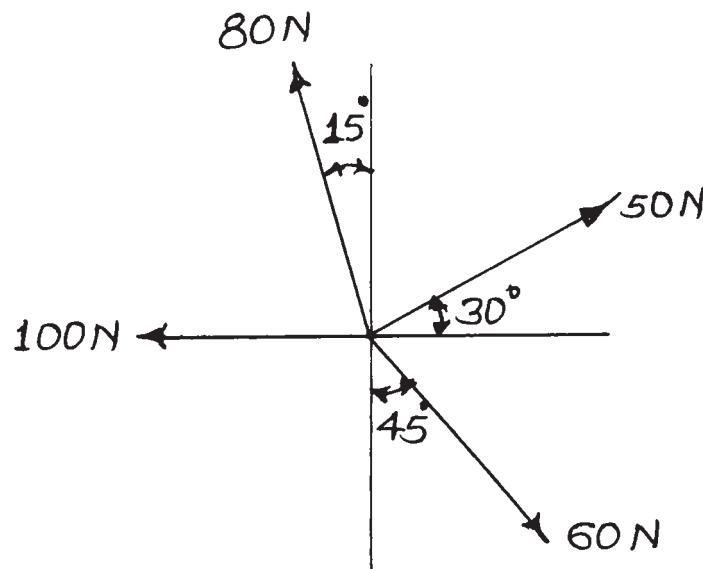


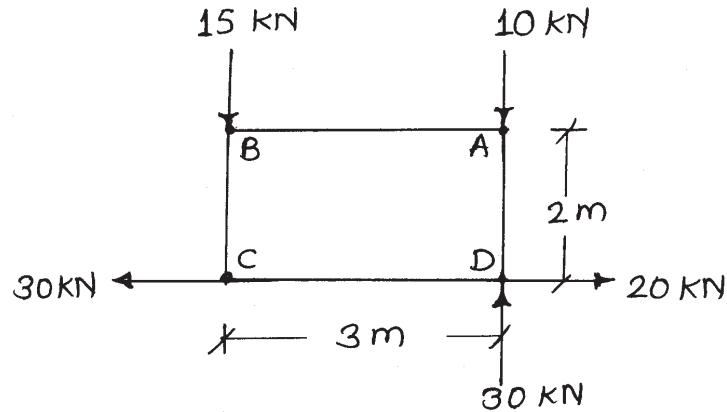
Fig. No. 1

- b) State triangle law of forces with sketch and state its use.
- c) Calculate load lifted by differential axle and wheel, if the diameter of wheel is 36 cm and that of axles are 9 cm and 6 cm. The efficiency of the machine is 80% and an effort is of 100 N.
- d) Calculate effort required to lift a load of 3 kN. In a machine a load of 1 kN is lifted by an effort of 56 N and 2 kN is lifted by an effort of 96 N.

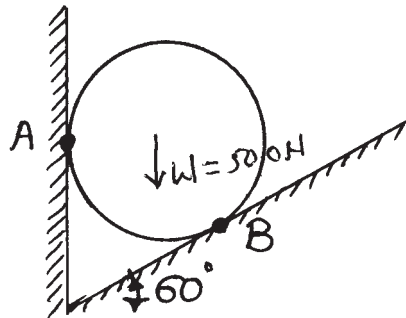
4. Attempt any THREE of the following:

12

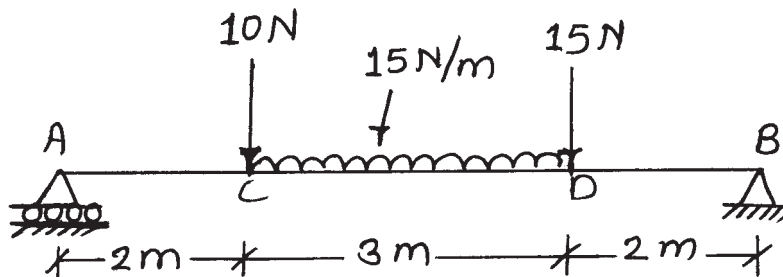
- a) Calculate moment of all forces about point 'A' for the force system as shown in Fig. No. 2.

Fig. No. 2

- b) Calculate the reactions offered by planes. Refer Fig. No. 3. A sphere weighs 500N is supported by two planes, One plane is vertical and other is inclined at  $60^\circ$  to the horizontal.

Fig. No. 3

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

Fig. No. 4

- d) Calculate coefficient of friction if a block weighing 600 N resting on a rough horizontal plane can be moved by a force of 150 N applied at an angle of  $60^\circ$  with the horizontal.
- e) Calculate tension in the strings AB and BC if a weight of 200 N is attached by two strings as shown in Fig. No. 5.

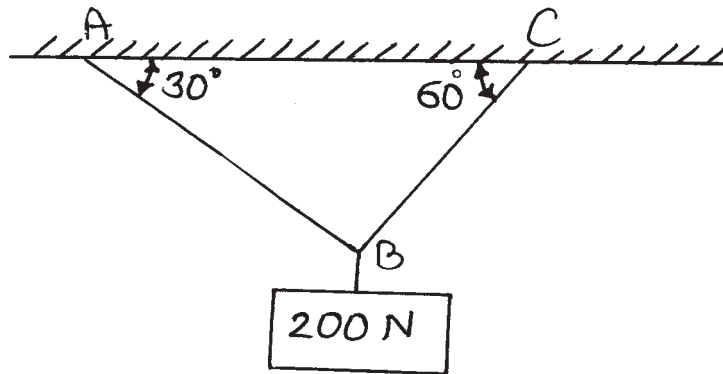


Fig. No. 5

5. Attempt any TWO of the following:

12

- a) Calculate the reactions using analytical method for a beam shown in Fig. No. 6.

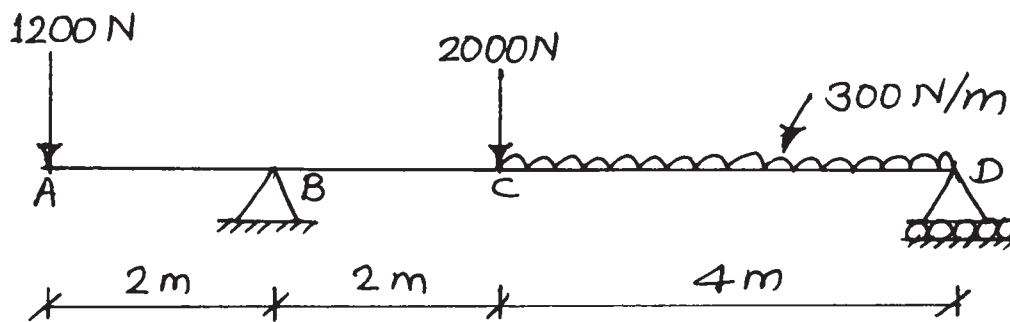


Fig. No. 6

- b) Calculate the force 'P' applied parallel to the plane, just to move the block up the plane, if the block weighing 500N is placed on an inclined plane at an angle of  $20^\circ$  with the horizontal. Coefficient of friction is 0.14.

- c) Find the resultant in magnitude and locate it on the sketch with respect to point 'A' for the force system shown in Fig. No. 7.

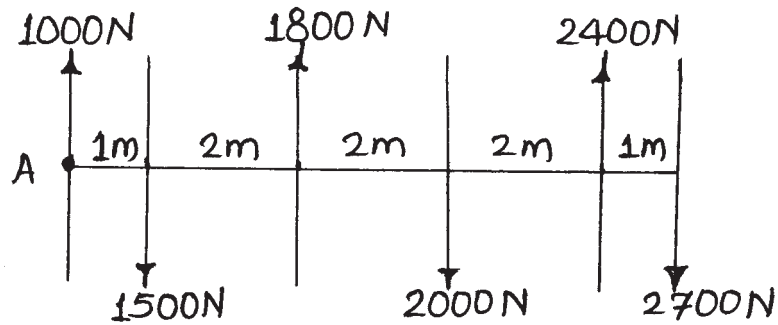


Fig. No. 7

6. Attempt any TWO of the following:

12

- a) Calculate the position of centroid from bottom left corner 'B' for a retaining wall as shown in Fig. No. 8.

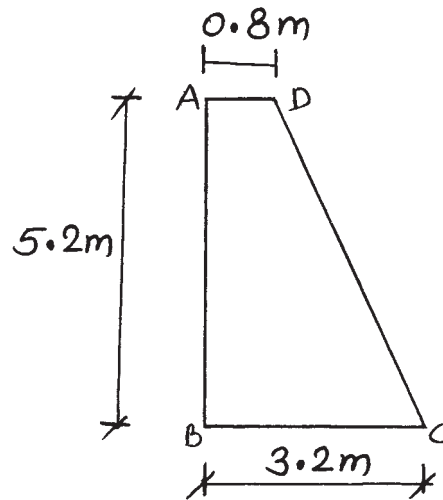


Fig. No. 8

- b) Locate the centroid of shaded area as shown in Fig. No. 9 with respect to origin.

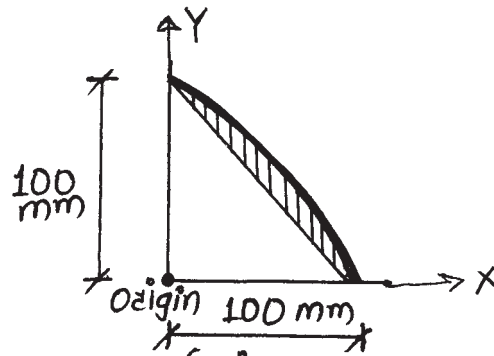


Fig. No. 9

- c) Locate centre of gravity of a composite solid body from tip 'A' of the cone as shown in Fig. No. 10.

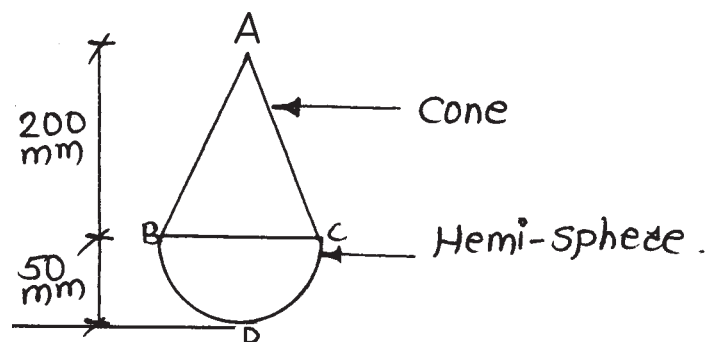


Fig. No. 10

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