

# 22203

**23124**

**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 S.I. unit of force and momentum.
  - b) What is law of machine
  - c) Define funicular polygon.
  - d) Write the condition of equilibrium for non-concurrent co-planer force system.
  - e) State two types of beam with diagram of each.
  - f) What do you mean by friction.
  - g) Define centre of gravity. How does it differ from centroid?

P.T.O.

2. Attempt any THREE of the following: 12

- State any two properties and effect of force.
- Certain machine has a law of machine  $P = 0.025 W + 20 \text{ N}$  with V.R. = 50. Calculate its efficiency at a load of 1 KN.
- Define effort lost in friction and load lost in friction. Give expression of them.
- Define angle of repose with diagram.

3. Attempt any THREE of the following: 12

- Find magnitude and direction of resultant force, If 30 N, 40N, 50 N and 60 N, forces are acting the line joining the centre of square to its vertices as shown in Fig. no. 1.

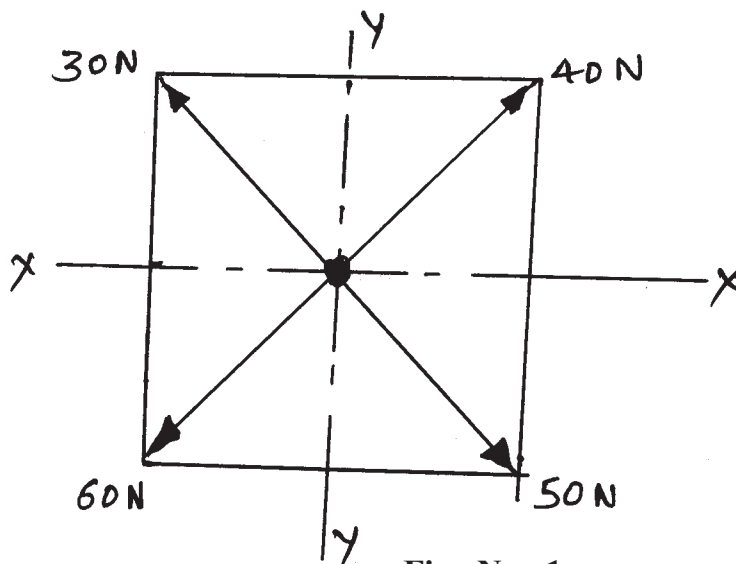


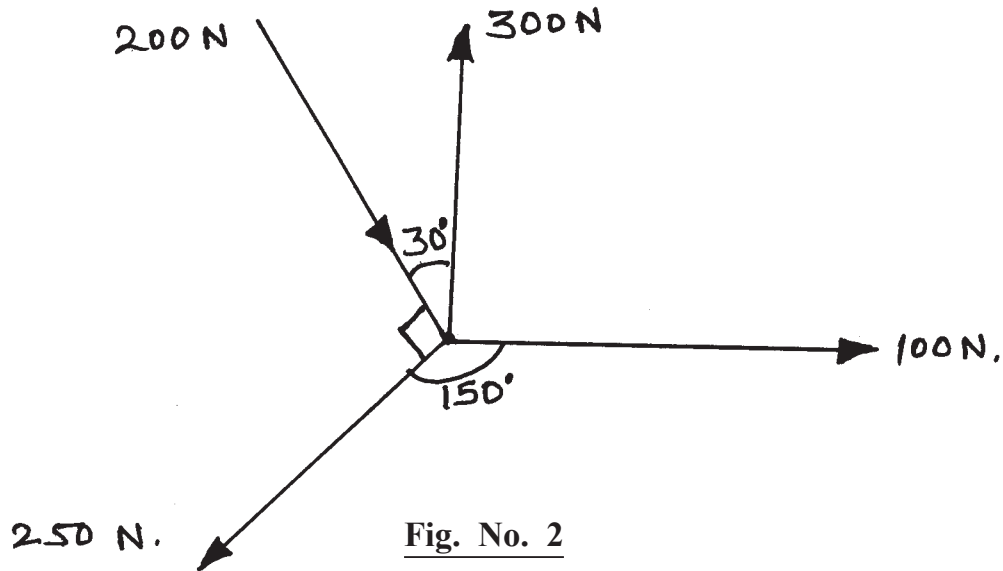
Fig. No. 1

- State any four properties of couple.
- For three sheave pulley block an effort of 40 N can lift a load of 180 N. Calculate the effort lost in friction and load lost in friction along with efficiency.
- In a lifting machine an effort of 110 N raised a load of 1100 N and an effort 500 N raised a load of 5800 N. Find the law of machine.

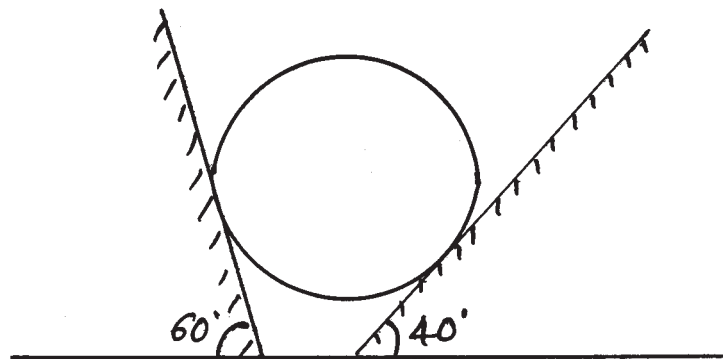
4. Attempt any THREE of the following:

12

- a) Find analytically the resultant of coplaner concurrent force system as shown in Fig. no. 2. Also locate its position on figure.



- b) Find the reactions offered by two surfaces of a sphere weighing  $1000\text{ N}$ . Refer Fig. no. 3.

Fig. No. 3

- c) A simply supported beam of  $4\text{ m}$  span is loaded with an UDL of  $5\text{ KN/m}$  for  $2\text{ m}$  from left end and a point load of  $30\text{ KN}$  at  $1\text{ m}$  from right end. Find support reactions using graphical method.
- d) A parcel weighing  $200\text{ N}$  is just on the point of moving horizontally by a horizontal force of  $50\text{ N}$ . What is the coefficient of friction.

- e) Find analytically the reactions at roller and hinges support of a beam loaded as shown in Fig. no. 4

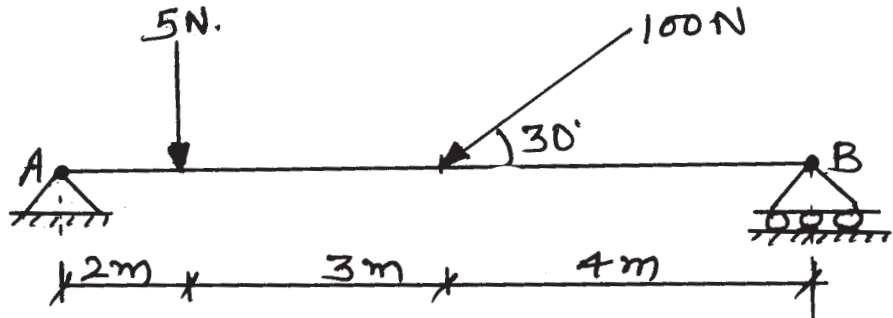


Fig. No. 4

5. Attempt any TWO of the following:

12

- a) A simply supported beam is subjected to point load of 100 kN and couple of 50 kNm as shown in Fig. no. 5. Determine the reactions at support A and B.

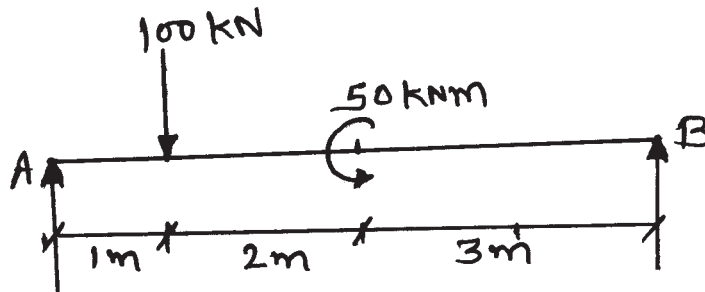


Fig. No. 5

- b) A block of weight 500 N is placed on a inclined plane at an angle of  $20^\circ$  with horizontal. If coefficient of friction is 0.15. Find the force P applied parallel to the plane, just move the body up the plane.
- c) Locate the resultant with magnitude and direction for the force system shown in Fig. no. 6 w.r.t. pt. A.

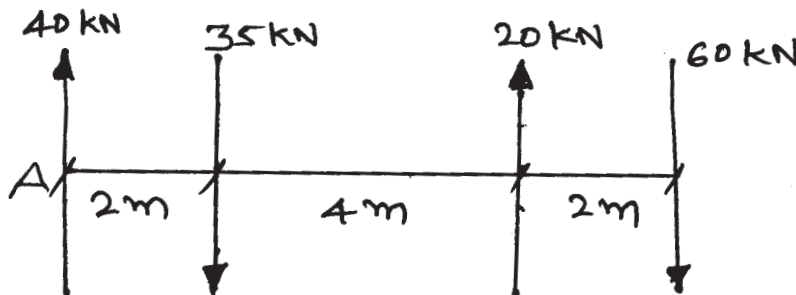


Fig. No. 6

6. Attempt any TWO of the following:

12

- a) Find centroid for ISA 90 x 60 x 8 mm (L section) as shown in Fig. no. 7.

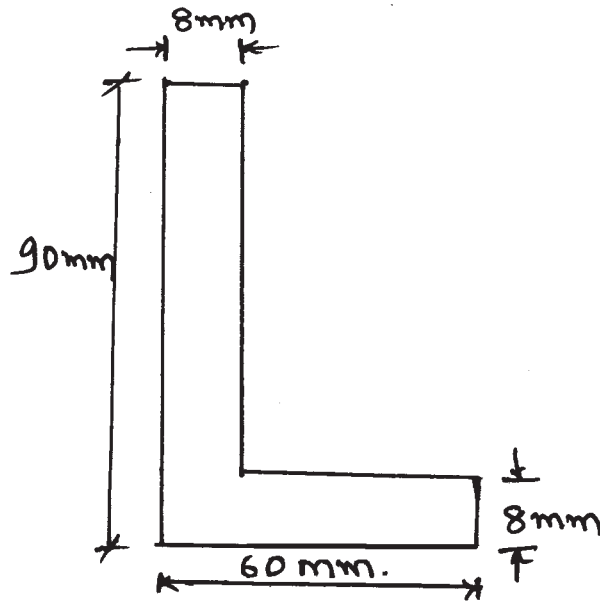


Fig. No. 7

- b) Locate the position of centroid for the lamina shown in Fig. no. 8.

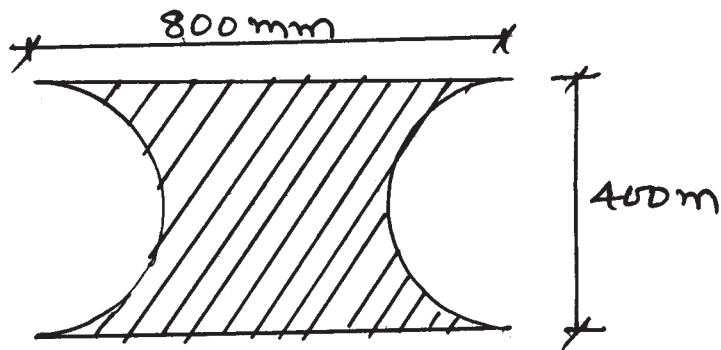


Fig. No. 8

- c) Find the  $\bar{y}$  of the composite body given in Fig. no. 9.

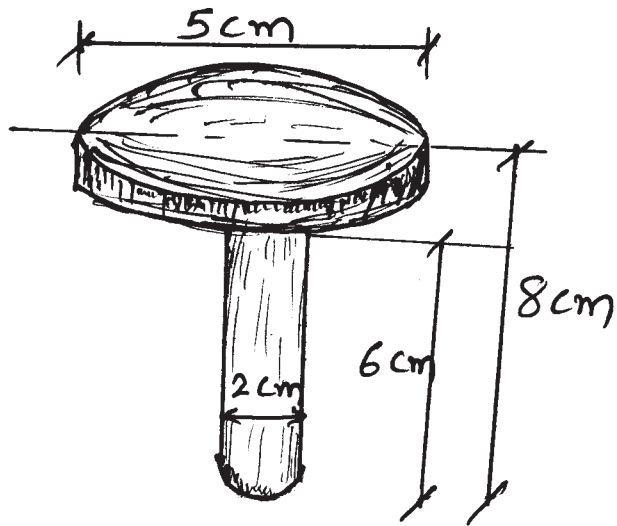


Fig. No. 9

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