

# 22203

**21718**

**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 principle of transmissibility of force.
  - b) Define load lost in friction.
  - c) Define resultant force.
  - d) State Lami's theorem.
  - e) Define angle of repose.
  - f) Define centre of gravity.
  - g) State any two types of beam along with sketch.

P.T.O.

2. Attempt any THREE of the following: 12

- Define unlike parallel force system and general force system with sketch.
- In a machine, an effort required to lift a certain load is 200 N. When efficiency is 60% find the ideal effort.
- What are the characteristic of ideal machine?
- State four laws of static friction.

3. Attempt any THREE of the following: 12

- Find the angle between two equal forces of magnitude 300 N each, if their resultant is 150 N.
- Find analytically the resultant of following concurrent force system. Refer to Figure No. 1.

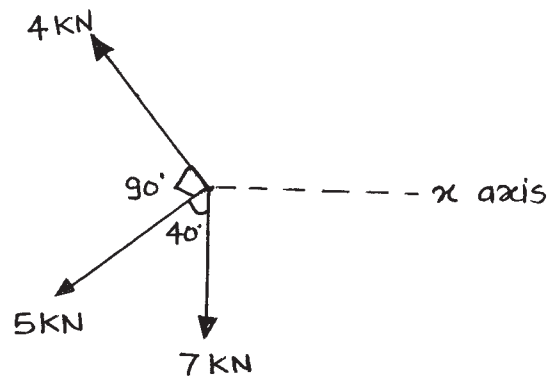


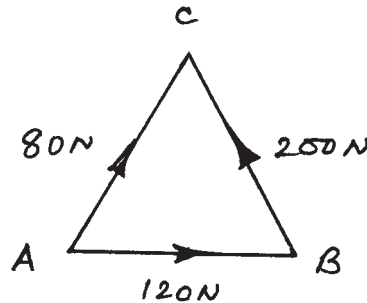
Fig. No. 1

- The diameter of bigger and smaller Pulley's of Weston's differential pulley block are 250 mm and 100 mm respectively. Determine effort required to lift a load of 3 kN with 80% efficiency.
- A machine has V.R. of 250 and has its law  $P = (0.01W + 5) \text{ N}$ , Find M.A., efficiency, effort lost in friction at a load of 1000 N and also state whether machine is reversible or not.

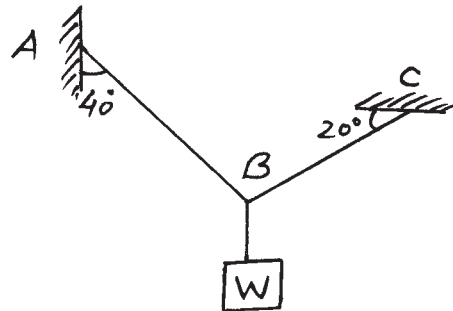
4. Attempt any THREE of the following:

12

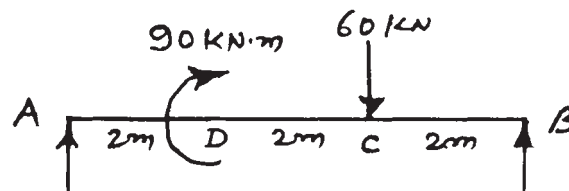
- a) Calculate the resultant and its position wrt. point A for the force system shown in Figure No. 2.  $AB = BC = CA = 2\text{m}$

Fig. No. 2

- b) Calculate the tension induced in the cable used for the assembly shown in Figure No. 3.  $W = 1500\text{ N}$ .

Fig. No. 3

- c) Calculate the reaction of beam loaded as shown in Figure No. 4.

Fig. No. 4

- d) A block weighing  $1000\text{ N}$ , resting on a horizontal plane requires a pull of  $400\text{ N}$  to start its motion. When applied at an angle of  $30^\circ$  with the horizontal. Find the coefficient of friction, along with normal reaction, force of friction and resultant reaction.

- e) Calculate the reaction of beam loaded as shown in Figure No. 5 use graphical method.

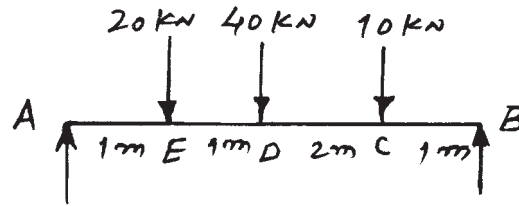


Fig. No. 5

5. Attempt any TWO of the following:

12

- a) Calculate reactions of beam loaded as shown in Figure No. 6.

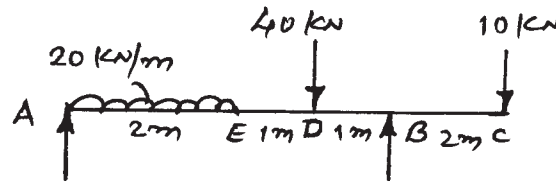


Fig. No. 6

- b) A push of 30 N applied at  $30^\circ$  to horizontal just move the block of weight 'W' N. If angle of friction is  $16^\circ$ . Find coefficient of friction, total reaction and weight of block.
- c) A concurrent force system is shown in Figure No. 7 find graphically the resultant of this force system.

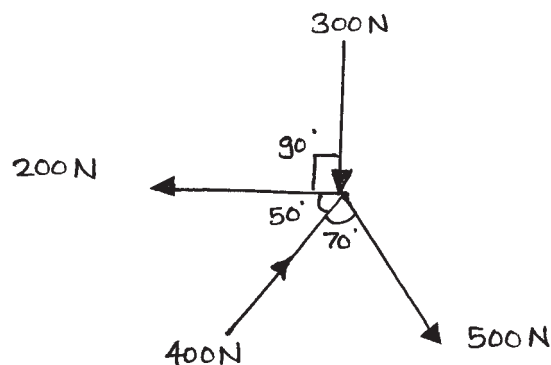


Fig. No. 7

6. Attempt any TWO of the following:

12

- a) Locate the position of centroid for the section shown in Figure No. 8.

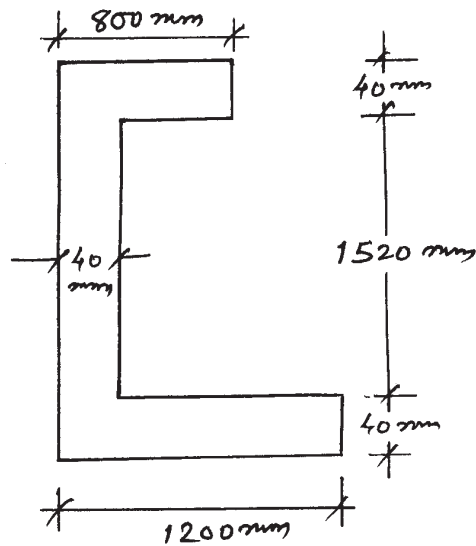


Fig. No. 8

- b) Locate the centroid of lamina shown in Figure No. 9.

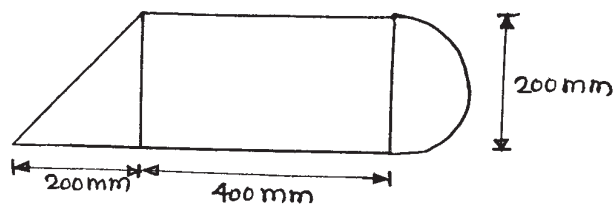


Fig. No. 9

- c) Find the centre of gravity for the solid shown in Figure No. 10.

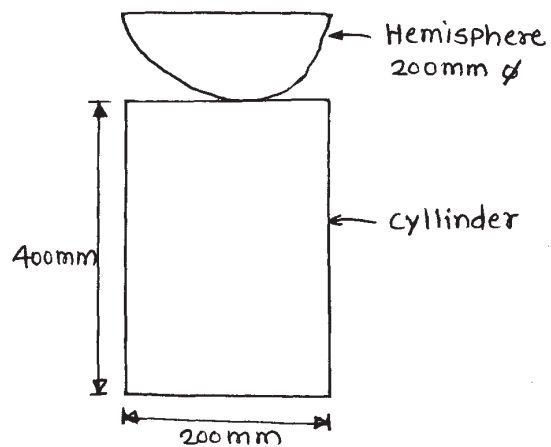


Fig. No. 10