22203

21718

3 Hours / 70 Marks   Seat No. ☐ ☐ 2 1̶7̶ 3 5 4 5

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 transmisibility 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.

Marks

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

    a) Define unlike parallel force system and general force system with sketch.

    b) In a machine, an effort required to lift a certain load is 200 N. When efficiency is 60% find the ideal effort.

    c) What are the characteristic of ideal machine?

    d) State four laws of static friction.

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

    a) Find the angle between two equal forces of magnitude 300 N each, if their resultant is 150 N.

    b) Find analytically the resultant of following concurrent force system. Refer to Figure No. 1.
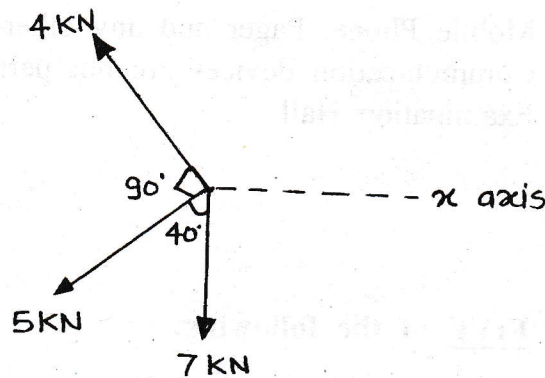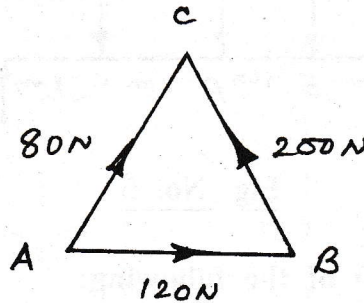

Fig. No. 1

    c) 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.

    d) A machine has V.R. of 250 and has its law $P = (0.01W + 5)$ N, Find M.A., efficiency, effort lost in friction at a load of 1000 N and also state whether machine is reversible or not.
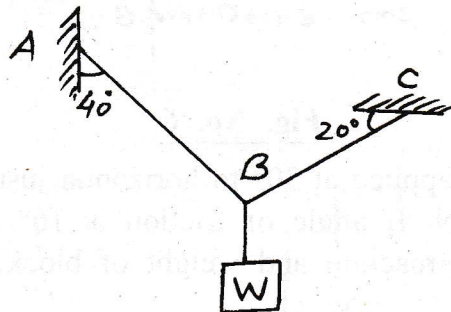
Marks

4.   **Attempt any THREE of the following:**   12
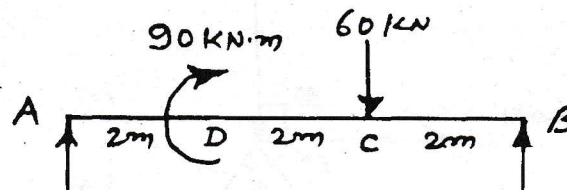
a) Calculate the resultant and it's position wrt. point A for the force system shown in Figure No. 2. AB = BC = CA = 2m

Fig. No. 2

b) Calculate the tension induced in the cable used for the assembly shown in Figure No. 3. W = 1500 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 N, resting on a horizontal plane requires a pull of 400 N to start its motion. When applied at an angle of 30° with the horizontal. Find the coefficient of friction, along with normal reaction, force of friction and resultant reaction.

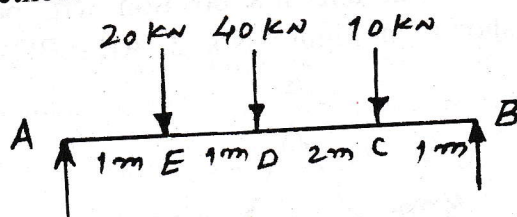e) Calculate the reaction of beam loaded as shown in Figure No. 5 use graphical method.

Fig. No. 5

12

5. **Attempt any TWO of the following:**

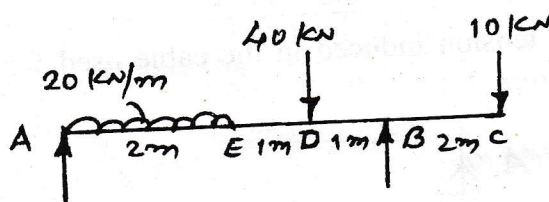a) Calculate reactions of beam loaded as shown in Figure No. 6.

Fig. No. 6

b) A push of 30 N applied at 30° to horizontal just move the block of weight 'W' N. If angle of friction is 16°. Find coefficient of friction, total reaction and weight of block.

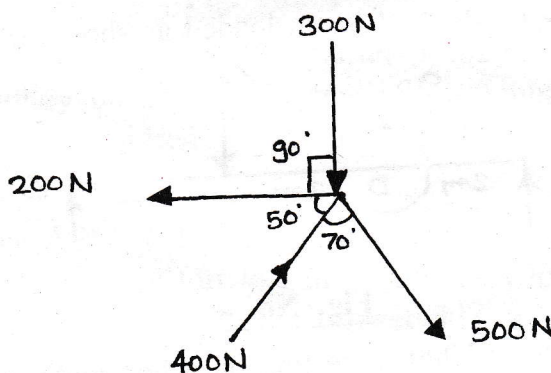c) A concurrent force system is shown in Figure No. 7 find graphically the resultant of this force system.

Fig. No. 7

6. **Attempt any TWO of the following:** 12

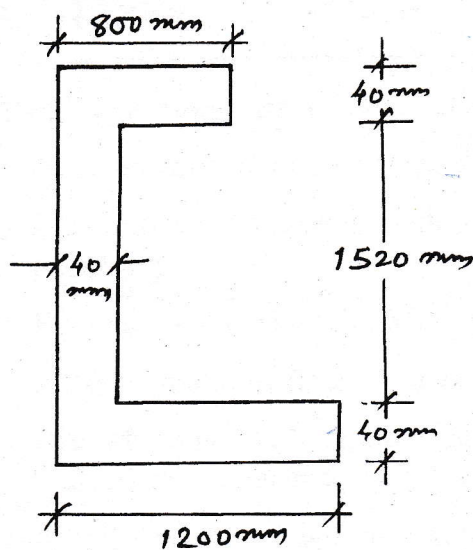a) Locate the position of centroid for the section shown in Figure No. 8.

Fig. No. 8

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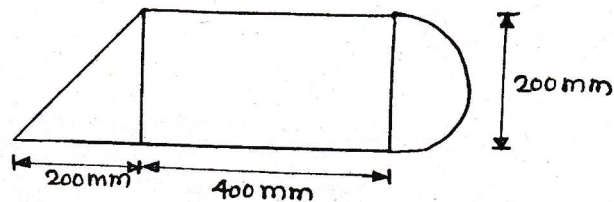

Fig. No. 9

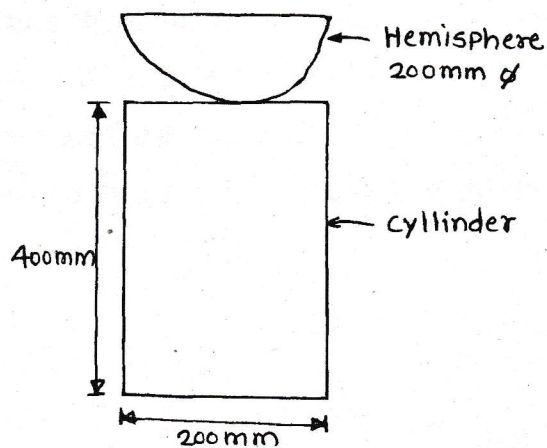c) Find the centre of gravity for the solid shown in Figure No. 10.

Fig. No. 10