

22203

11819

3 Hours / 70 Marks

Seat No.

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- Instructions* – (1) All Questions are *Compulsory*.
- (2) Illustrate your answers with neat sketches wherever necessary.
- (3) Figures to the right indicate full marks.
- (4) Assume suitable data, if necessary.
- (5) Use of Non-programmable Electronic Pocket Calculator is permissible.

Marks

1. **Attempt any FIVE of the following:** **10**
- a) State characteristics of force.
- b) Define Mechanical Advantage and Velocity Ratio.
- c) State law of Parallelogram of forces.
- d) State analytical conditions of equilibrium of concurrent force system.
- e) Define coefficient of friction and angle of repose.
- f) Define centroid and centre of gravity.
- g) Write relation between resultant and equilibrant.
2. **Attempt any THREE of the following:** **12**
- a) Define force and state its effects.
- b) The law of certain machine is $P = \frac{W}{50} + 8 \text{ N}$ and V.R. 100.
Find the maximum possible M.A. and maximum possible efficiency in %. While lifting a load of 600N, what will be the efficiency?

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- c) Define ideal machine and state law of machine for it with help of sketch.
- d) Write two advantages and two disadvantages of friction.

3. Attempt any THREE of the following: 12

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

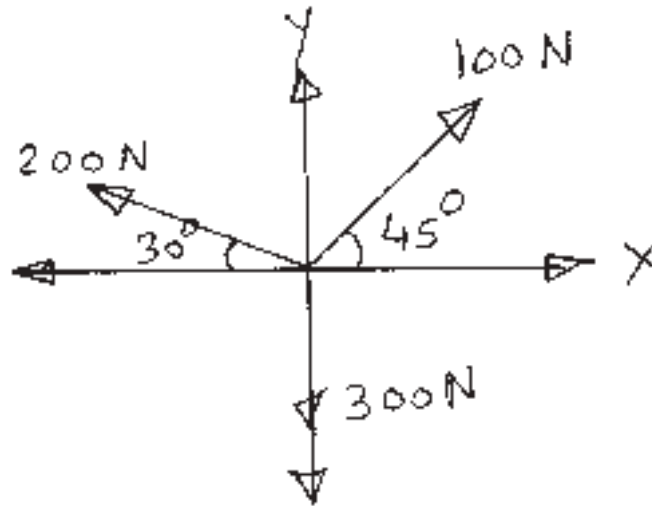


Fig. No. 1

- b) State and explain Lami's theorem with sketch.
- 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) In a machine load of 500 N was lifted by an effort 50 N, Another load of 750 N was lifted by an effort of 60 N. Obtain law of machine.

4. Attempt any THREE of the following: 12

- a) ABCD is a rectangle such that $AB = 3\text{ m}$ and $BC = 2\text{ m}$. Along side AB, CB, CD and AD, the forces of 100 N, 200 N, 250 N, 300 N are acting respectively. Find magnitude, direction and position of the resultant force from C. Use analytical method only.

- b) Calculate reactions offered by surface as shown in Figure No. 2, if a cylinder weighing 1000N is resting on inclined surfaces at 90° and 50° with horizontal.

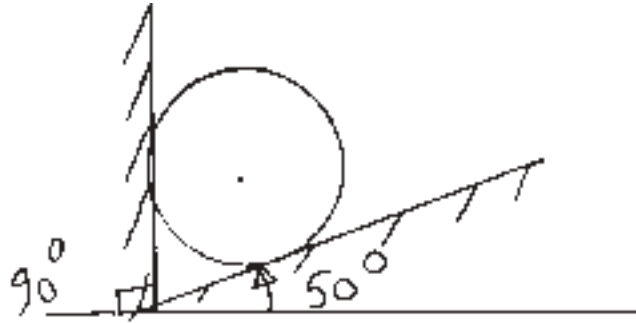


Fig. No. 2

- c) Calculate graphically the reactions of a beam loaded as shown in Figure No. 3.

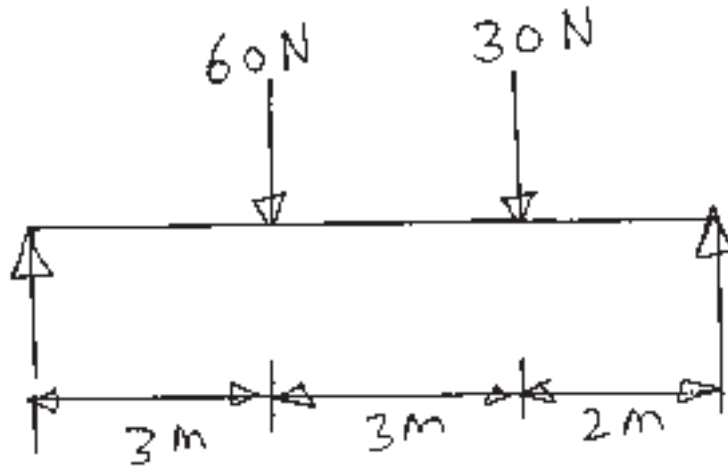


Fig. No. 3

- d) A block weighing 40kN resting on a rough horizontal plane can be moved by a force 20kN applied at angle 40° with horizontal. Find the coefficient of friction.

- e) A simply supported beam of 6m span has subjected to loading as shown in Figure No. 4. Find support reactions by analytical method.

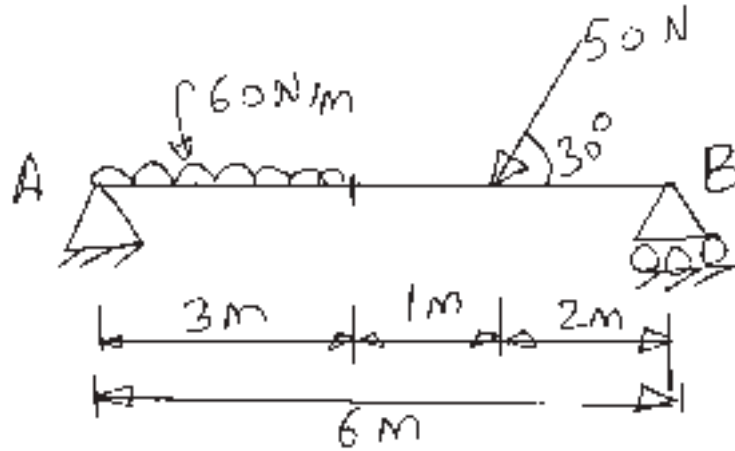


Fig. No. 4

5. Attempt any TWO of the following:

12

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

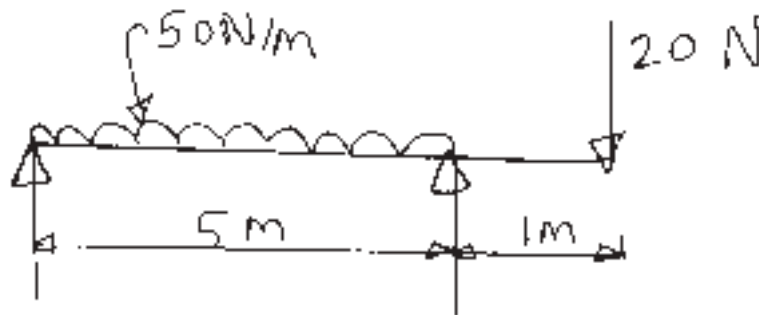


Fig. No. 5

- b) A block weighing 100N on a 30° inclined rough plane. If coefficient of friction is 0.25. Calculate force required to be applied parallel to plane to make the block slide downward.

- c) Locate the resultant with magnitude and direction for a parallel force system as shown in Figure No. 6.

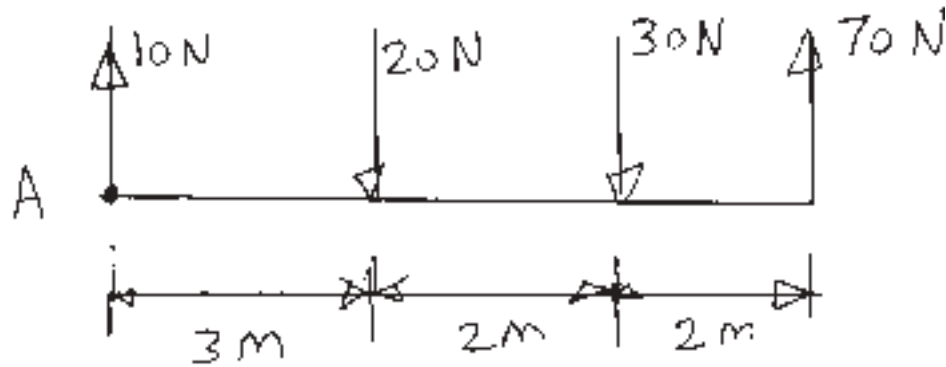


Fig. No. 6

6. Attempt any TWO of the following:

12

- a) Calculate position of centroid for T section as shown in Figure No. 7 with respect to 'A'.

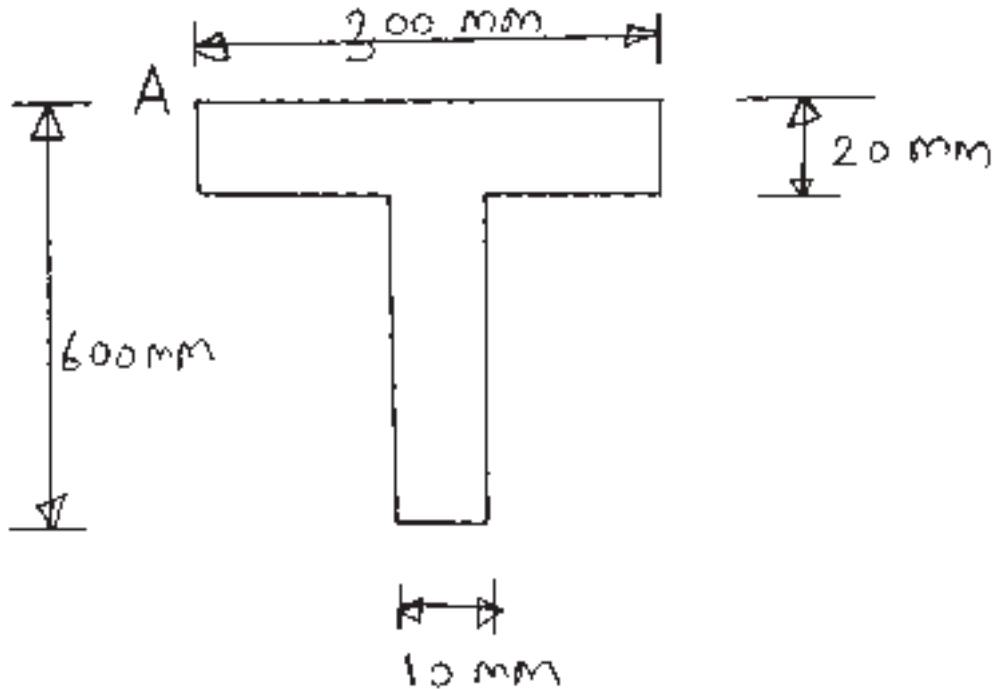


Fig. No. 7

- b) Calculate position of centroid of shaded area as shown in Figure No. 8.

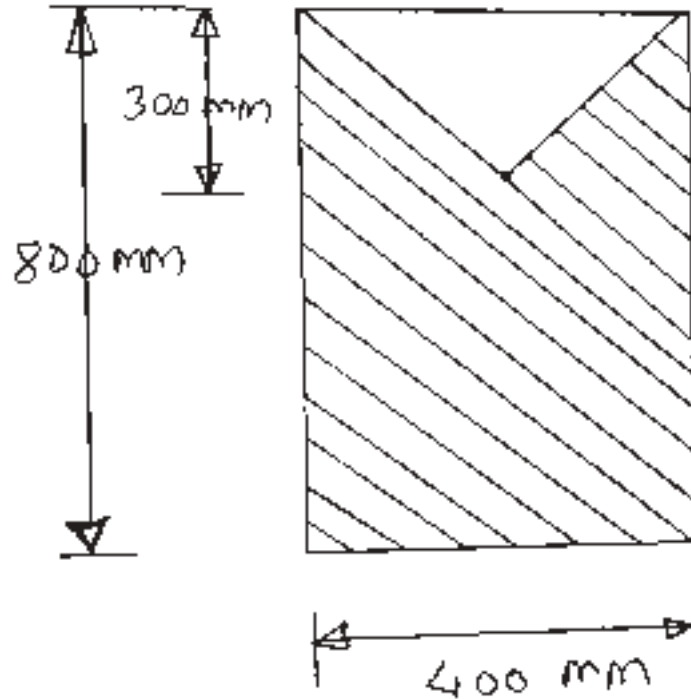


Fig. No. 8

- c) A solid cone of 500mm height and 200mm base diameter. The portion above half of its height is removed. Locate the point at which remaining body can be balanced.
