

22203

12425

03 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) What is the Principle of transmissibility of force.
 - b) Define self locking machine.
 - c) What is space diagram and vector diagram.
 - d) Define Static Friction and Dynamic Friction.
 - e) List the analytical condition of equilibrium for coplanar concurrent force system.
 - f) State the position of centroid of semi circle of radius 'R' with neat sketch.
 - g) Show the relation between resultant and equilibrant.

P.T.O.

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

- Explain coplanar force system in detail.
- Certain machine has a law of machine $P = 0.025W + 20N$ with $V.R = 60$. Calculate efficiency at a load of $1KN$.
- Explain reversible and non-reversible machine. State condition for them.
- Illustrate four laws of static friction.

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

- Apply analytical method to find resultant of concurrent force system as shown in Fig. No. 1

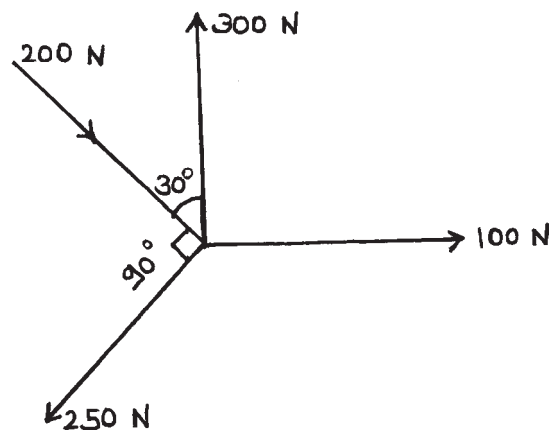


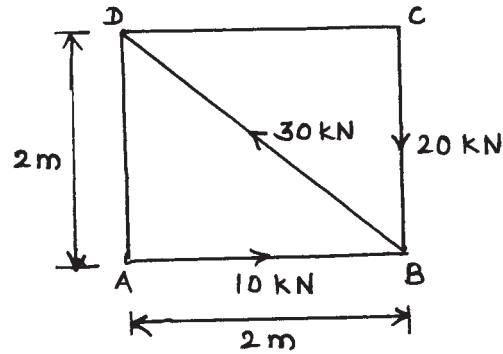
Figure No. 1

- Explain triangle law of forces with sketch and state its uses.
- In a differential axle and wheel the diameter of wheel is $20cm$ and diameter of axle are $8cm$ and $7cm$. Calculate and load lifted by an effort of $200N$ if the efficiency of machine is 80% .
- Calculate effort required to lift a load of $3KN$ in a machine a load of $1KN$ is lifted by an effort of $56N$ and $2KN$ is lifted by an effort of $96N$. Find the law of machine.

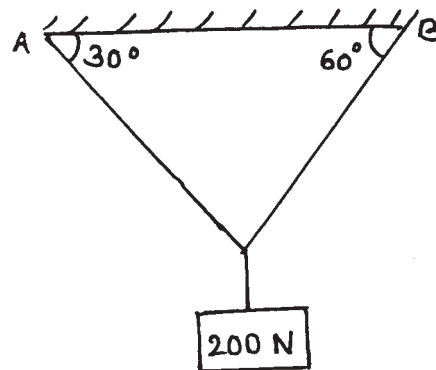
4. Attempt any THREE of the following:

12

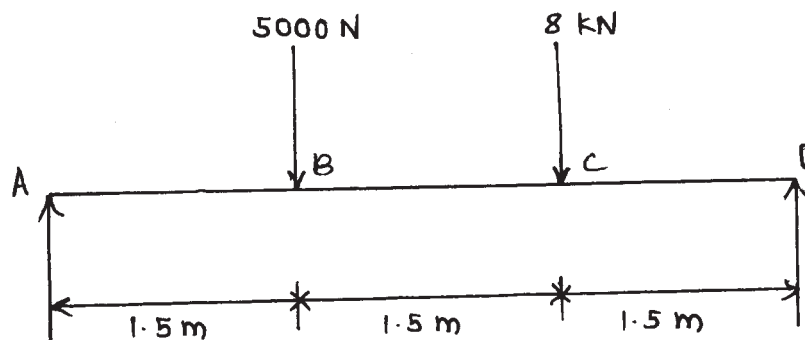
- a) Calculate resultant moment of the forces about point 'A' for the force system as shown in Fig. No. 2.

Figure No. 2

- b) Calculate the tension induced in the cable used for assembly shown in Fig. No. 3

Figure No. 3

- c) A beam is loaded as shown in Fig. No. 4 Calculate the support reactions using Graphical method only.

Figure No. 4

- d) Calculate co-efficient of friction if a block weighing 500N resting on rough horizontal plane can be moved by a force of 140N applied at an angle of 60° with the horizontal.
- e) Calculate analytically the support reactions of beam loaded as shown in Fig. No. 5.

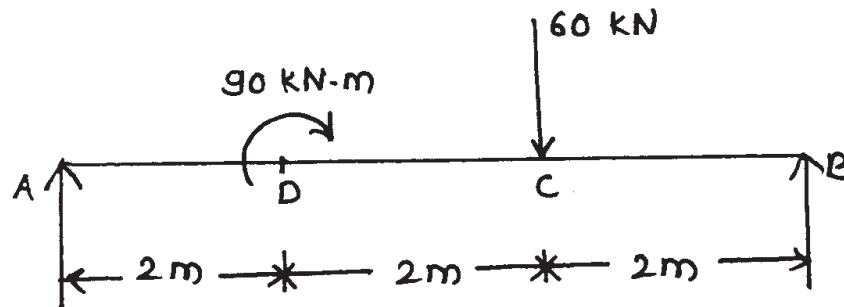


Figure No. 5

5. Attempt any TWO of the following:

12

- a) Calculate the reaction of beam loaded as shown in Fig. No. 6.

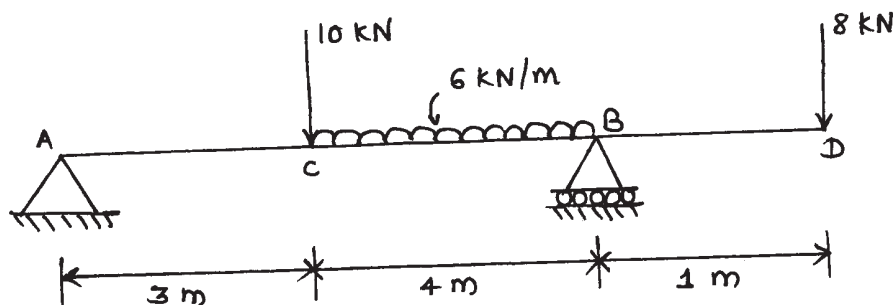


Figure No. 6

- b) A block weighing 60N resting on rough inclined plane at an angle of 30° to the horizontal. If co-efficient of friction is 0.12 Determine force required to prevent the body from falling down the plane.

- c) Calculate the resultant in magnitude and locate its position w.r.t. point A for the force system as shown in Fig. No. 7.

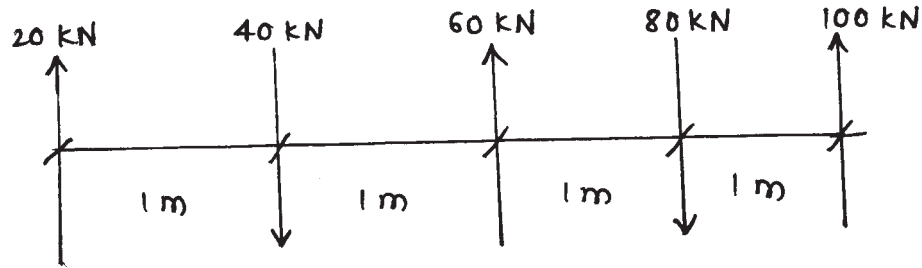


Figure No. 7

6. Attempt any TWO of the following:

12

- a) Find position of centroid for L-section as shown in Fig. No. 8.

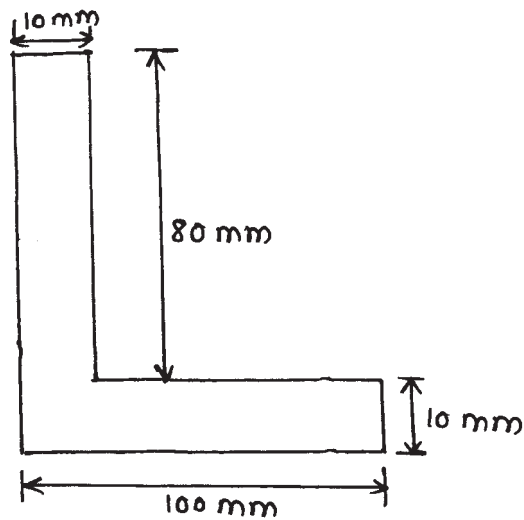


Figure No. 8

- b) Locate the centroid of shaded area as shown in Fig. No. 9 w.r.t. origin.

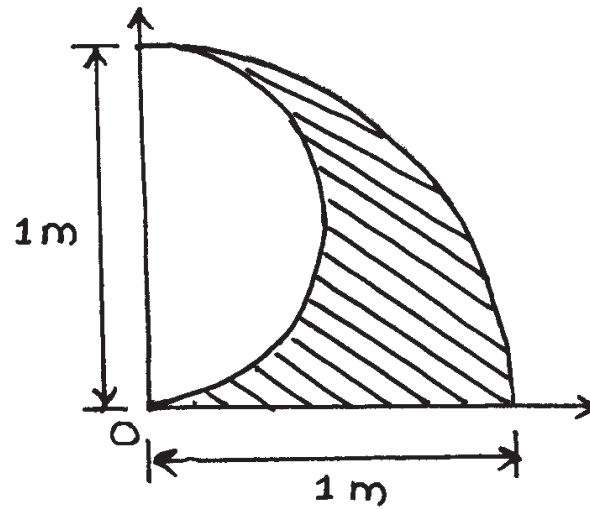


Figure No. 9

- c) Calculate position of centre of gravity of the Frustrum of cone as shown in Fig. No. 10.

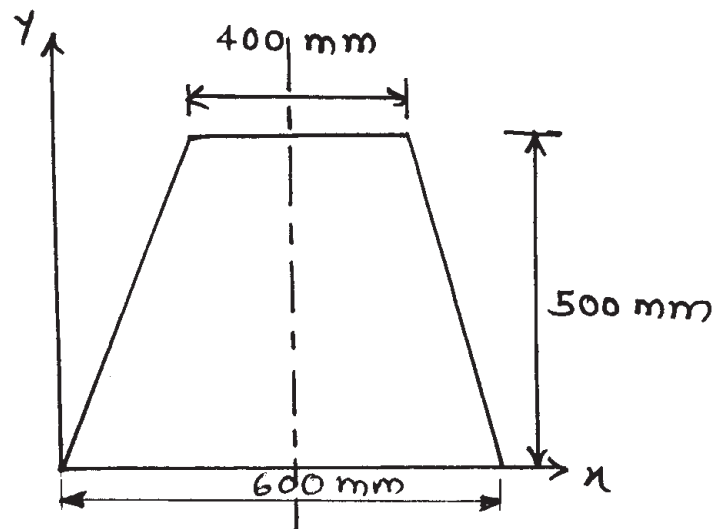


Figure No. 10