

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

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

3. Attempt any THREE of the following: 12

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

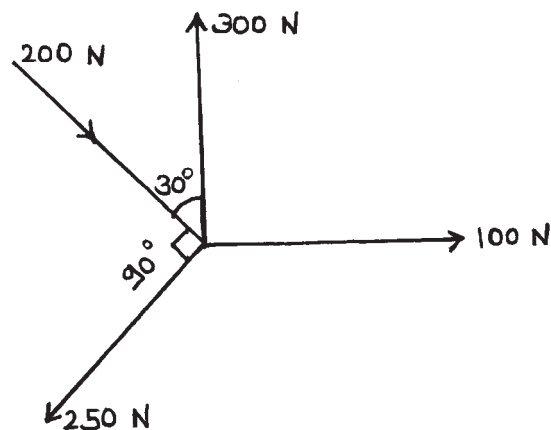


Figure No. 1

- b) Explain triangle law of forces with sketch and state its uses.
- c) 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%.
- d) 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.

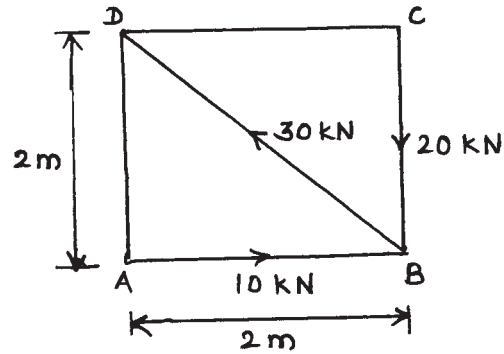


Figure No. 2

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

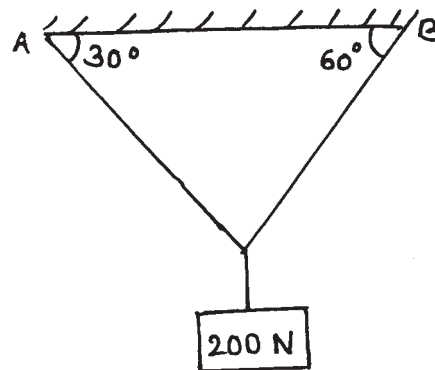


Figure No. 3

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

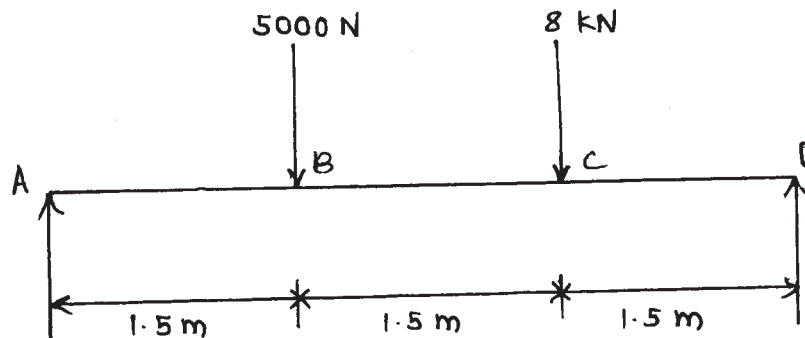


Figure No. 4

- 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.

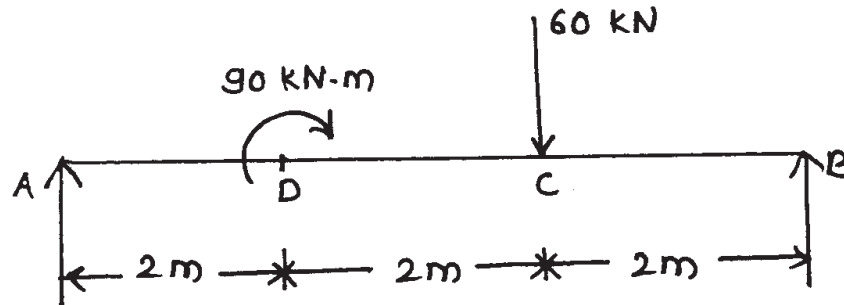


Figure No. 5

5. Attempt any TWO of the following:

12

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

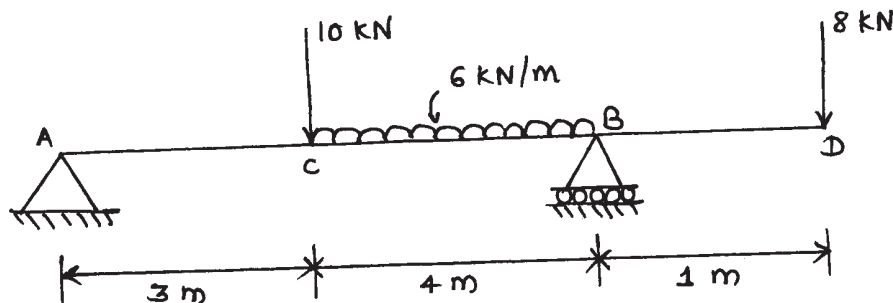


Figure No. 6

- 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.

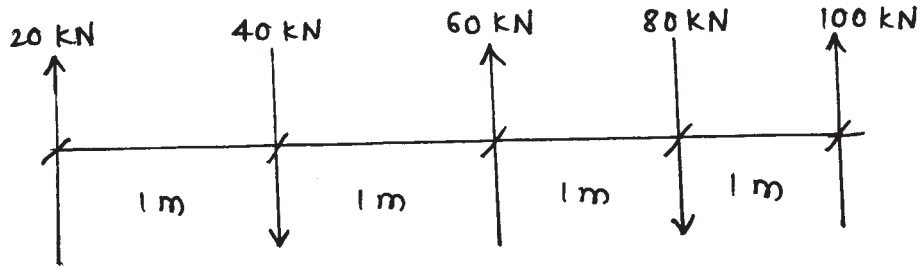


Figure No. 7

6. Attempt any TWO of the following: 12
- a) Find position of centroid for L-section as shown in Fig. No. 8.

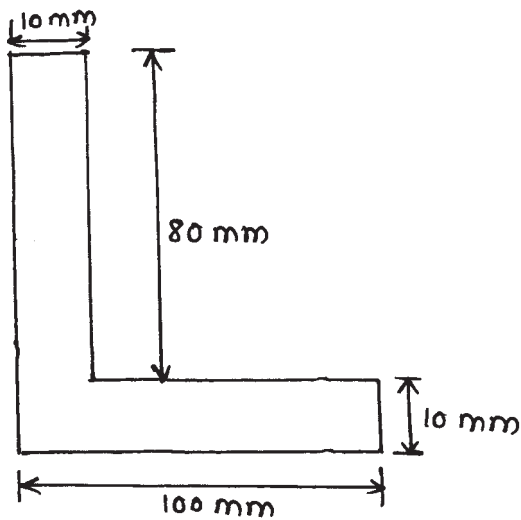


Figure No. 8

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

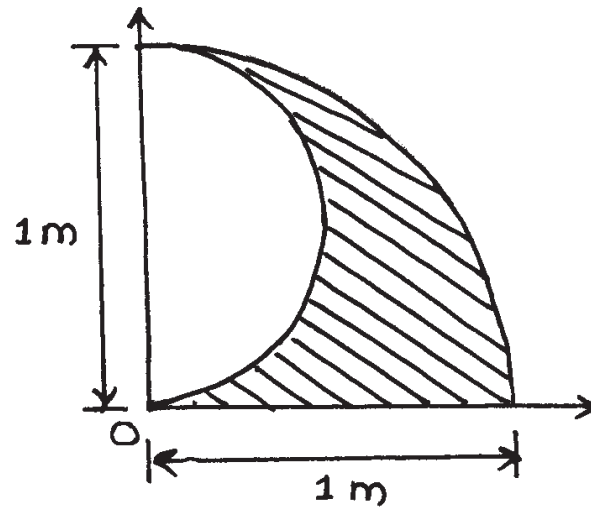


Figure No. 9

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

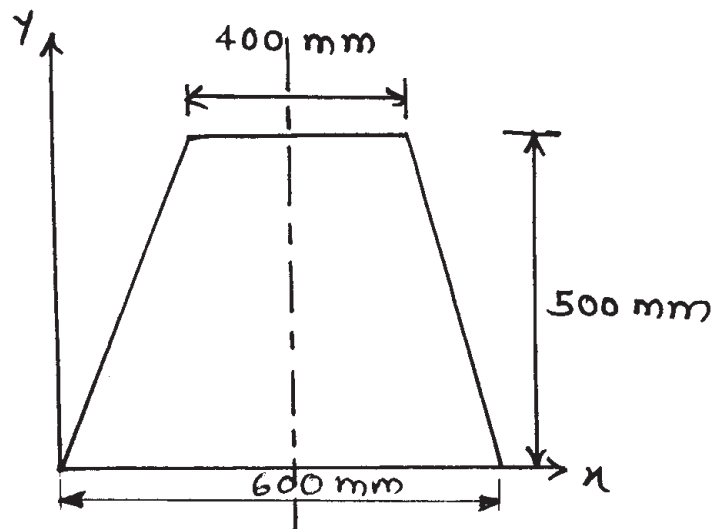


Figure No. 10