

312312

25226

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.
 - (6) 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 Law of machine.
- (b) State Varignon's theorem of Moment.
- (c) State the analytical condition of equilibrium of coplanar non-concurrent force system.
- (d) Define Coefficient of Friction.
- (e) State the centroid of semi-circle and show it on sketch.
- (f) Define reversible machine and state the condition for reversibility.
- (g) State the law of parallelogram of forces.

2. Attempt any THREE of the following :

12

- (a) A screw jack lifts a load of 41.25 kN with an effort of 550 N, applied at the end of handle of 60 cm. If the pitch of screw is 15 mm, calculate velocity ratio, mechanical advantage and efficiency of the machine.
- (b) A Weston's differential pulley block is used to lift a load of 8 kN. The diameter of pulleys are 26 cm and 24 cm. Calculate the effort required if the efficiency is 45%. Also calculate load lost in friction.
- (c) Certain machine follows the law $P = (0.02 W + 14)N$. When the load is lifted by 2 cm, the effort has to move 150 cm. State with reason, whether the machine is reversible or not.
- (d)
 - (i) Sketch the nature of graph between load and ideal effort.
 - (ii) Differentiate between reversible and non-reversible machine.



3. Attempt any THREE of the following :

12

- (a) A horizontal force P as shown in Fig. No. 1 keeps the weight of 200 N in equilibrium. Calculate the magnitude of force P and tension in the string.

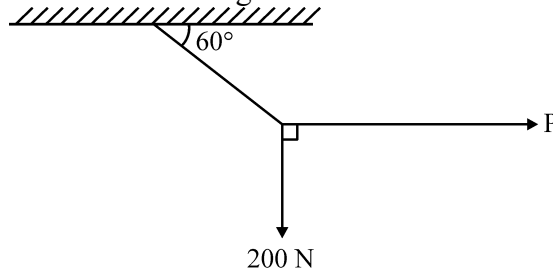


Fig. No. 1

- (b) Calculate the support reaction for the given simply supported beam as shown in Fig. 2.

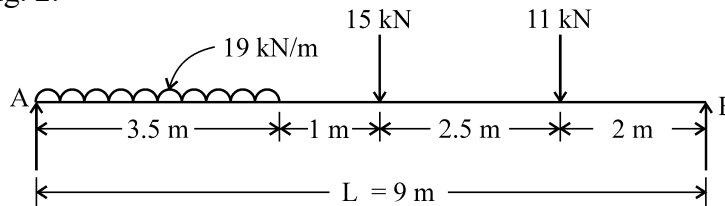


Fig. No. 2

- (c) For a beam as shown in Fig. No. 3. calculate reaction at roller and hinge support by analytical method.

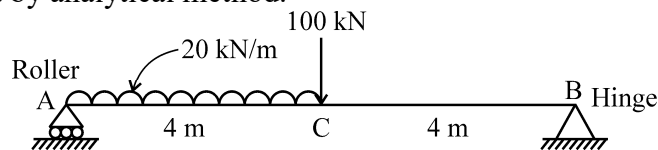


Fig. No. 3

- (d) State Lami's theorem with mathematical equation and write its any two limitations.

4. Attempt any THREE of the following :

12

- (a) Determine the resultant of the coplanar non-concurrent forces as shown in Fig. No. 4.

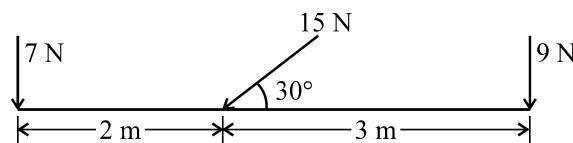


Fig. No. 4

- (b) Find the value of W if the body is in limiting equilibrium as shown in Fig. No. 5.

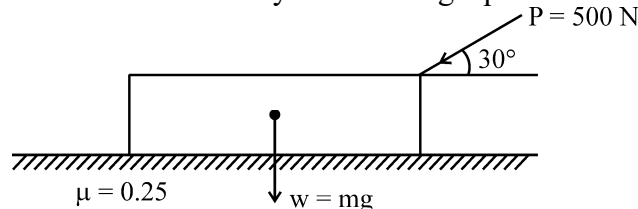


Fig. No. 5

- (c) A circular hole of 50 mm diameter is cut from a circular disc of diameter 100 mm as shown in figure. Find the C.G. of the section from A in Fig. No. 6.

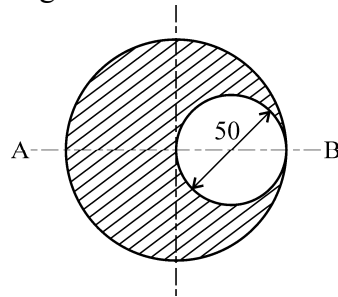


Fig. No. 6

- (d) Locate the resultant with magnitude and direction for the force system shown in Fig. No. 7 w.r.t. point A.

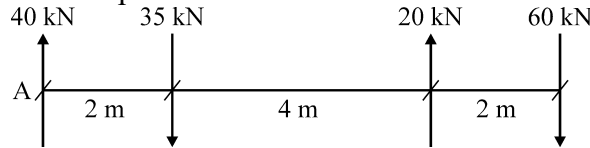


Fig. No. 7

- (e) Locate centre of gravity of a composite solid body from tip 'A' of the cone as shown in Fig. No. 8.

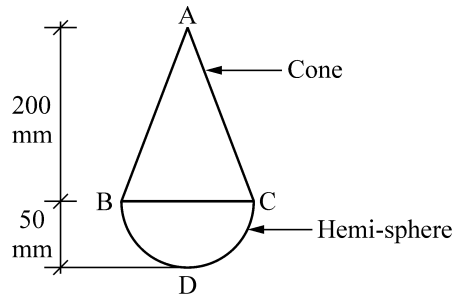


Fig. No. 8

5. Attempt any TWO of the following :

12

- (a) A block of weight 500 N is placed on an inclined plane at an angle of 20° with horizontal. If coefficient of friction is 0.15. Find the force P applied parallel to the plane, just to move the body up the plane.
- (b) Find the resultant force in magnitude and direction for the force system shown in Fig. No. 9. Use analytical method.

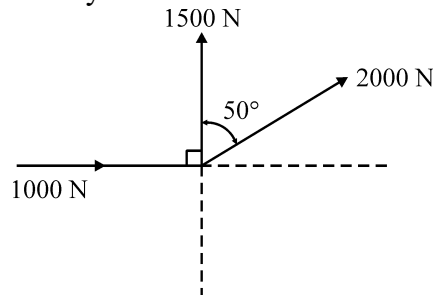


Fig. No. 9

P.T.O.

