

Time : 1 Hour]

[Max. Marks : 30]

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4.
- 2) Neat sketches must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.
- 5) Use of electronic pocket calculator is allowed .
- 6) Use of cell phone is prohibited in the examination hall.

Q1) a) State and explain resolution and composition of force with suitable sketch. [4]

b) Find the magnitude of the resultant and its direction of the following forces acting at a point O as shown in Fig. 1 b. [5]

c) Determine the magnitude and direction of resultant with reference to point A for the force system as shown in Fig. 1 c if side of square is 1 m. [6]

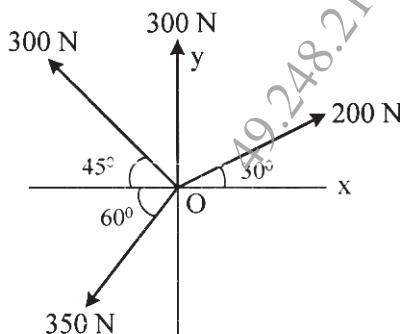


Fig. 1 b

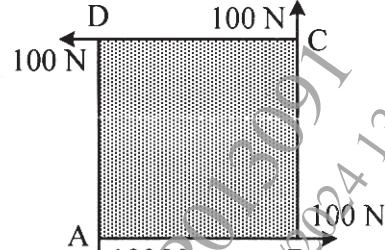


Fig. 1 c

OR

P.T.O.

Q2) a) The resultant of two forces P and Q is 1400 N vertical. Determine the force Q and the corresponding angle θ for the system of forces as shown in Fig. 2 a. [5]

b) Determine the magnitude and direction of resultant with reference to point A for the force system as shown in Fig. 2 b if side of equilateral triangle is 1 m. [6]

c) State and explain Varignon's theorem with suitable sketch. [4]

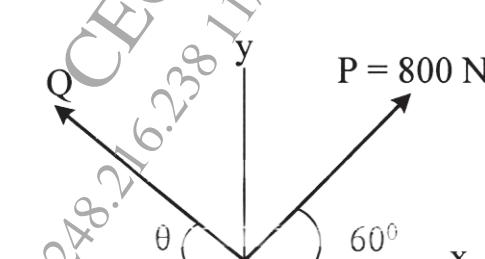


Fig. 2 a

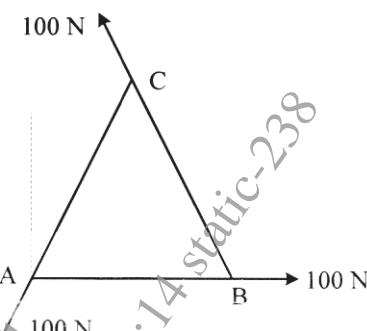


Fig. 2 b

Q3) a) State angle of repose, angle of friction, coefficient of friction and cone of friction with suitable sketch. [5]

b) Locate the centroid of the shaded area as shown in Fig. 3 b with respect to origin O. [5]

c) A 400 N block is resting on a rough horizontal surface as shown in Fig. 3 c for which the coefficient of friction, $\mu_s = 0.4$. Determine the force P required to cause motion. [5]

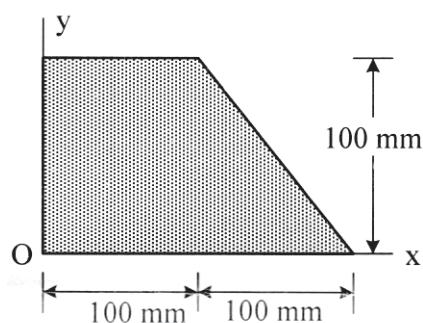


Fig. 3 b

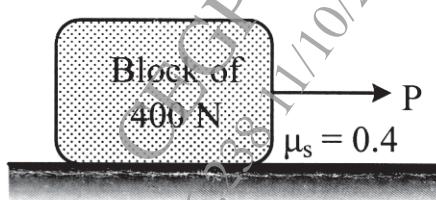


Fig. 3 c

OR

Q4) a) Differentiate centroid and center of gravity. [4]

b) Determine the moment of inertia of the section about centroidal axis as shown in Fig. 4 b. [5]

c) A cable is passing over the disc of belt friction apparatus at a lap angle 180^0 as shown in Fig. 4 c. If coefficient of statics friction is 0.4 and the weight of the block is 500 N, determine the range of force P to maintain equilibrium. [6]

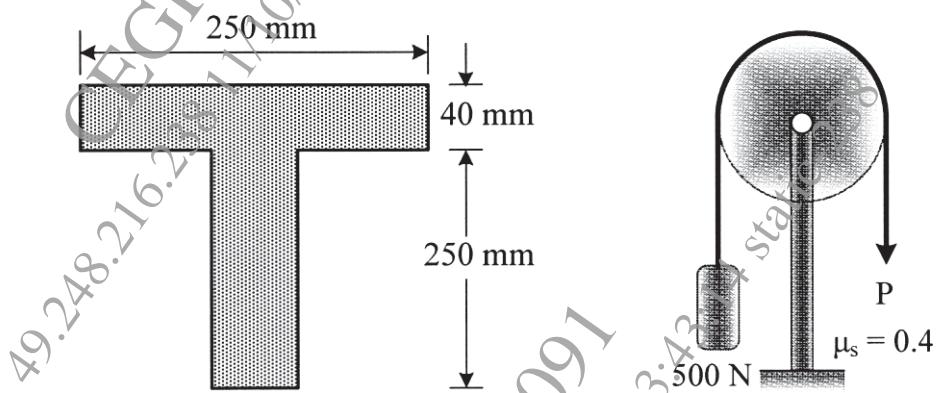


Fig. 4 b

Fig. 4 c

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