Total No. of Questions : 4]

SEAT No. :

PC380

[Total No. of Pages : 3

[6358]-112
F.E. (Insem)
ENGINEERING MECHANICS
(2019 Pattern) (Semester - I) (101011)

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]**

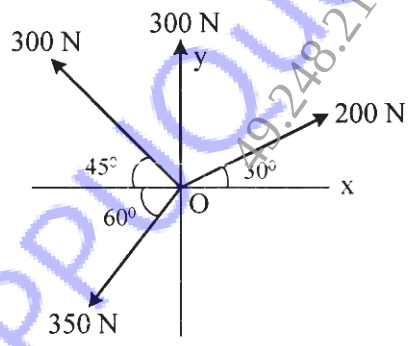

Fig. 1 b

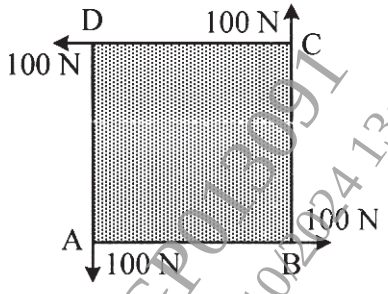

Fig. 1 c

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]**

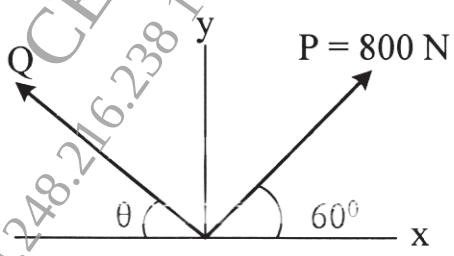

Fig. 2 a

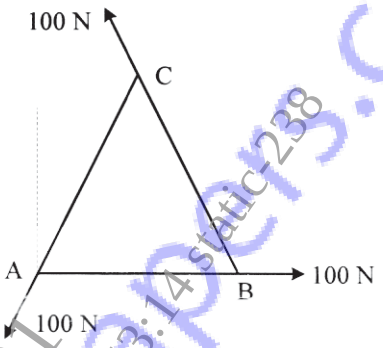

Fig. 2 b

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, μ_s = 0.4. Determine the force P required to cause motion. **[5]**

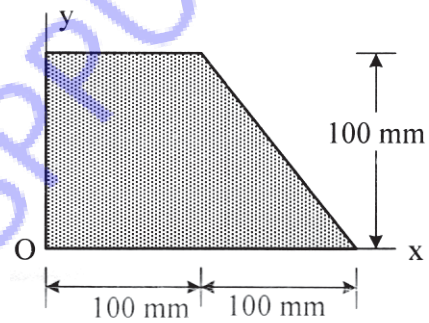

Fig. 3 b

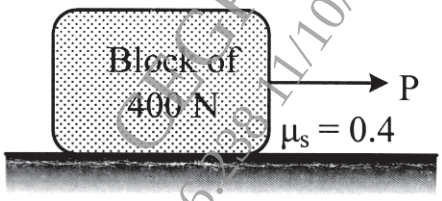

Fig. 3 c

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]**

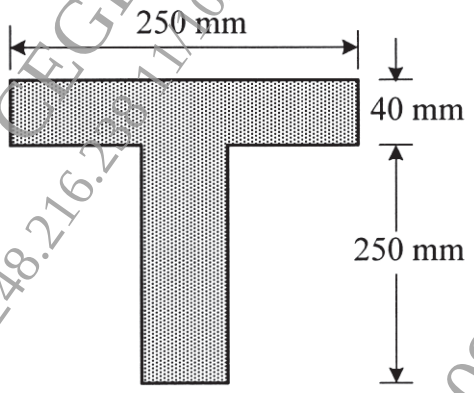

Fig. 4 b

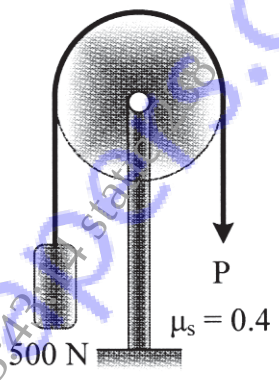

Fig. 4 c

ⓘⓘⓘⓘ