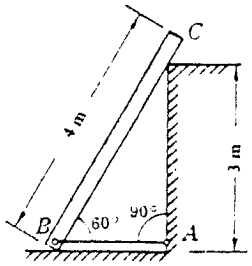
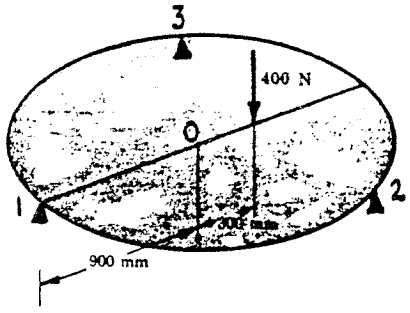
CONCORDIA UNIVERSITY
Faculty of Engineering and Computer Science
ENGR 242/4 Statics, Section J
Test #2

Marks — Attempt all questions, only calculators permitted. — Time: 60 Minutes

30 1) Determine the tension in the cable AB which holds the 9-Kg post BC from sliding. Assume all surfaces are smooth.

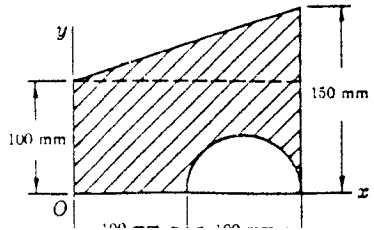


35 2) The circular table 1800 mm in diameter supports a load of 400 N located on a diameter through the support 1 and 300 mm from the center on the opposite side from support 1. Supports 1, 2 and 3 are equally-spaced simple supports. Determine the reactions developed on these supports.



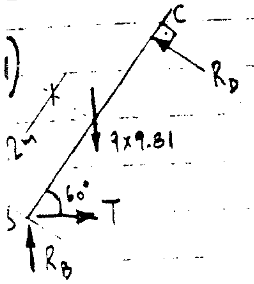
Pin correction?
2 load 4ow?

35 3) A semicircular area is removed from the trapezoid as shown. Determine the y coordinate of the centroid of the remaining shaded area. Tables are not available for this problem.



ENGR 242/4 Section J Test #2, Solutions

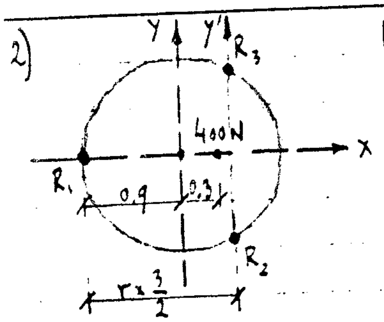
1)



$\sum M_B = 0 = -9\times 9.81\times 2\cos 60^\circ + R_D\, 3/\cos 30^\circ \Rightarrow R_D = 25.5$ N

$\sum F_x = 0 = T - R_D\cos 30^\circ \Rightarrow \underline{\underline{T}} = 25.5\cos 30^\circ = \underline{\underline{22.1\ N}}$

2)



because of symmetry : $R_2 = R_3$ (or from $\sum M_x = 0$) Z direction coming out ?

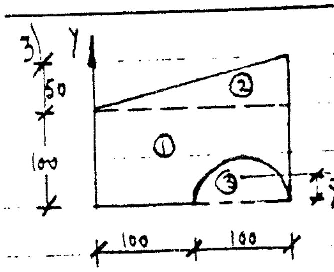
$\sum F_z = 0 = R_1 + 2R_2 - 400 \Rightarrow R_2 = (400 - R_1)/2$

$\sum M_{y'} = 0 = +R_1 \times \frac{3\times 0.9}{2} - 400\times(0.15) \Rightarrow \underline{\underline{R_1 = 44.4\ N}} \quad \therefore R_2 = R_3 = (400 - 44.4)/2$

why positive ?

$\therefore \underline{\underline{R_2 = R_3 = 177.8\ N}}$

3)



For semicircular area : $\frac{4}{3}\pi r^3 = \frac{\pi r^2}{2}\bar{y}_3 2\pi \Rightarrow \bar{y}_3 = \frac{4r}{3\pi} = \frac{4\times 50}{3\pi} = 21.2$ mm

$$\underline{\underline{\bar{Y}}} = \frac{A_1\bar{y}_1 + A_2\bar{y}_2 - A_3\bar{y}_3}{A_1 + A_2 - A_3} = \frac{200\times 100\times 50 + 50\times 100\times(100 + \frac{50}{3}) - \pi\frac{50^2}{2}\times 21.2}{200\times 100 + 50\times 100 - \pi\times\frac{50^2}{2}} = \frac{1500082.8}{21073} = \underline{\underline{71.2\ \text{m}}}$$

PLEASE LEARN FROM YOUR MISTAKES !!!