CE 201-2 (041)

Quiz # 1

Prob: 2-29 (Page-30)

Given

The forces shown in Figure-1,
R = 500 lb, F is minimum.

Req.d

Magnitude of F, θ

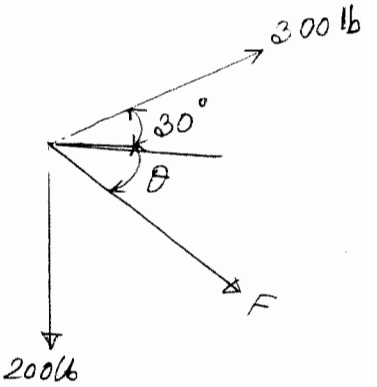

Fig.-1

Soln:

Step-1:
Find the Resultant of the two known forces and call it $R_1$ (Fig-2)

$$R_1 = \sqrt{(200)^2 + (300)^2 - 2(200)(300)\cos 60^\circ}$$
$$= 264.575 \text{ lb}$$

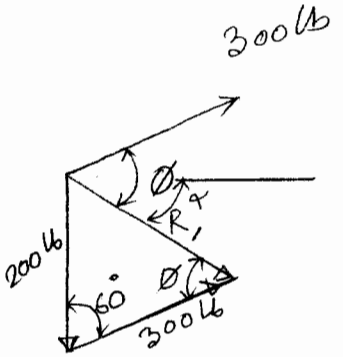

Fig-2

Step-2:

To know min.F with resultant = 500 lb, $R_1$ & F need to be in the same line (direction) Fig-3.

Thus $\alpha \equiv \theta$

$$\frac{200}{\sin \phi} = \frac{264.575}{\sin 60}$$

$$\therefore \phi = 40.893$$

$$\alpha = \theta = 40.893 - 30 = 10.89$$

$$\therefore \boxed{\theta = 10.89^\circ}$$

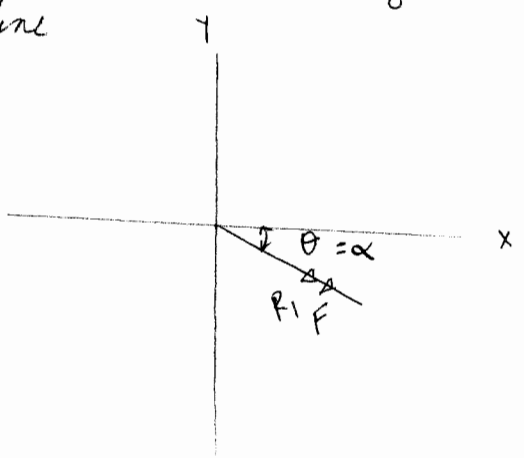

Fig. 3

$$R = R_1 + F$$

$$\Rightarrow 500 = 264.575 + F$$

$$\therefore \boxed{F = 235.4} \text{ lb}$$