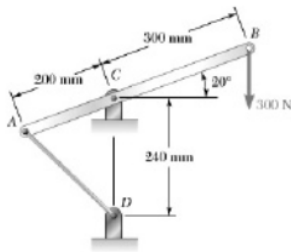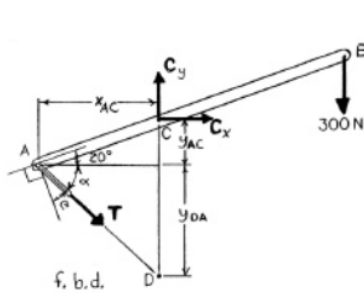## PROBLEM 4.28

A lever AB is hinged at C and is attached to a control cable at A. If the lever is subjected to a 300-N vertical force at B, determine (a) the tension in the cable, (b) the reaction at C.

SOLUTION

f. b.d.

First

$$x_{AC} = (0.200 \text{ m})\cos 20° = 0.187\ 939 \text{ m}$$

$$y_{AC} = (0.200 \text{ m})\sin 20° = 0.068\ 404 \text{ m}$$

Then

$$y_{DA} = 0.240 \text{ m} - y_{AC}$$
$$= 0.240 \text{ m} - 0.068404 \text{ m}$$

and

$$\tan \alpha = \frac{y_{DA}}{x_{AC}} = \frac{0.171\ 596}{0.187\ 939}$$

$$\therefore \ \alpha = 42.397°$$

and

$$\beta = 90° - 20° - 42.397° = 27.603°$$

(a) From f.b.d. of lever AB

$$+ \curvearrowleft \ \Sigma M_C = 0: \quad T\cos 27.603°(0.2 \text{ m})$$

$$- 300 \text{ N}\left[(0.3 \text{ m})\cos 20°\right] = 0$$

$$\therefore \ T = 477.17 \text{ N} \qquad \text{or } T = 477 \text{ N} \blacktriangleleft$$

(b) From f.b.d. of lever AB

$$\xrightarrow{+} \ \Sigma F_x = 0: \quad C_x +(477.17 \text{ N})\cos 42.397° = 0$$

$$\therefore \ C_x = -352.39 \text{ N}$$

or

$$\mathbf{C}_x = 352.39 \text{ N} \leftarrow$$

$$+\uparrow \ \Sigma F_y = 0: \quad C_y - 300 \text{ N} - (477.17 \text{ N})\sin 42.397° = 0$$

$$\therefore \ C_y = 621.74 \text{ N}$$

or

$$\mathbf{C}_y = 621.74 \text{ N} \uparrow$$