PROB. 12-68

$W = 5^{LB}$, $r = 10(t+4)^{-1}$ ft, $\theta = \frac{2}{\pi} \cdot \sin(\pi t)$

FIND F_r AND F_θ WHEN $t = 1^s$ AND $t = 6^s$

$\Sigma F_r = m[\ddot{r} - r(\dot{\theta})^2]$, $\Sigma F_\theta = m(r\ddot{\theta} + 2\dot{r}\dot{\theta})$

$\dot{r} = -10(t+4)^{-2}$, $\ddot{r} = 20(t+4)^{-3}$

$\dot{\theta} = 2\cos(\pi t)$, $\ddot{\theta} = -2\pi \cdot \sin(\pi t)$

$F_r = m\{[20(t+4)^{-3}] - [10(t+4)^{-1}] \cdot [2\cos(\pi t)]^2\}$

$F_r = m\{20(t+4)^{-3} - 40(t+4)^{-1} \cdot \cos^2(\pi t)\}$

$F_\theta = m\{[10(t+4)^{-1}] \cdot [-2\pi \cdot \sin(\pi t)] + 2[-10(t+4)^{-2}] \cdot [2\cos(\pi t)]\}$

$F_\theta = m\{-20\pi(t+4)^{-1} \cdot \sin(\pi t) - 40(t+4)^{-2} \cdot \cos(\pi t)\}$

AT $t = 1^s$:

$F_r = \frac{(5^{LB})}{(32.2 \frac{ft}{s^2})} \cdot \{20(1+4)^{-3} - 40(1+4)^{-1} \cdot \cos^2(\pi)\}$

$\boxed{F_r = -1.217^{LB}}$

$F_\theta = \left(\frac{5}{32.2}\right) \cdot \{-20\pi(5)^{-1} \cdot \sin(\pi) - 40(5)^{-2} \cdot \cos(\pi)\}$

$\boxed{F_\theta = 0.2484^{LB}}$

PROB. 12-68 CONT.

AT $t = 6^s$:

$$F_r = \left(\frac{5}{32.2}\right)\left\{20(10)^{-3} - 40(10)^{-1}\cdot\cos^2(6\pi)\right\}$$

$$\boxed{F_r = -0.6180\ ^{LB}}$$

$$F_\theta = \left(\frac{5}{32.2}\right)\cdot\left\{-20\pi(10)^{-1}\cdot\sin(6\pi) - 40(10)^{-2}\cdot\cos(6\pi)\right\}$$

$$\boxed{F_\theta = -0.06211\ ^{LB}}$$