PROB. 15-19

$r = 0.6^m$, $\alpha = \alpha_0 e^{-t}$, $\omega = 0$ @ $t = 0$, $\alpha_0 = 10 \frac{RAD}{s^2}$

FIND a_B WHEN $t = 0, \frac{1}{2}^s, \infty$

$a_t = r\alpha$, $a_n = r\omega^2$

$a_t = r\alpha_0 e^{-t}$

$\alpha = \frac{d\omega}{dt}$, $\omega = \int_0^t \alpha\, dt = \int_0^t \alpha_0 e^{-t}\, dt = -\alpha_0 \left[e^{-t}\right]_0^t$

$\omega = -\alpha_0 (e^{-t} - e^0) = \alpha_0 (1 - e^{-t})$

$a_n = r\omega^2 = r\left[\alpha_0 (1 - e^{-t})\right]^2$

a) FOR $t = 0$, $a_t = r\alpha_0 e^0 = (0.6^m)(10 \frac{RAD}{s^2}) = 6.0 \frac{m}{s^2}$

$a_n = r\left[\alpha_0 (1 - e^0)\right]^2 = 0$ $\boxed{a_B = 6.0 \frac{m}{s^2}}$

b) FOR $t = \frac{1}{2}^s$, $a_t = r\alpha_0 e^{-\frac{1}{2}} = (0.6)(10) e^{-\frac{1}{2}} = 3.639 \frac{m}{s^2}$

$a_n = (0.6)\left[(10)(1 - e^{-\frac{1}{2}})\right]^2 = 9.289 \frac{m}{s^2}$

$a_B = \sqrt{3.639^2 + 9.289^2}$ $\boxed{= 9.976 \frac{m}{s^2}}$

c) FOR $t = \infty$, $a_t = r\alpha_0 \cdot e^{-\infty} = 0$

$a_n = r\left[\alpha_0 (1 - e^{-\infty})\right]^2 = r\alpha_0^2 = (0.6)(10)^2 = 60 \frac{m}{s^2}$

$\boxed{a_B = 60 \frac{m}{s^2}}$