NAME #1 KEY

NAME #2 _____

ENGR 116 Quiz. Show all work for full credit. Answers to 3-digits. Box Answers

Open Note

#1 A pilot flies an airplane in the vertical circle of radius 1000 m. If the airplane is ~~accelerating~~ speeding up at the constant rate of 12 m/s^2, find the following:

a) The speed when the pilot is at position C at an angle of 30 degrees from the bottom of the circle.

b) The normal force exerted by the bottom of the seat on the 90-kg pilot at point C.

c) The tangential force exerted by the back of the seat on the 90-kg pilot at point C.

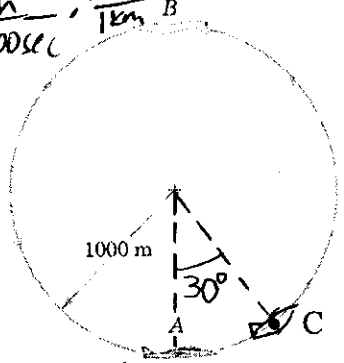
v_c = 201 m/s

F_n = 4.40 kN

F_t = 1.52 kN

$V_i = 600\frac{km}{h}\cdot\frac{1h}{3600sec}\cdot\frac{1000m}{1km}$

$= 166.7\frac{m}{s}$



$s = r\theta$

$= (1000m)(30°)\left(\frac{\pi rad}{180°}\right)$

$= 523.6m$

$V_f^2 = V_i^2 + 2as$

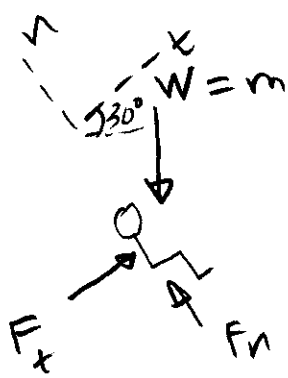
$= (166.7)^2 + 2(12)(523.6)$

$\therefore V_f = 200.9\frac{m}{s}$

$\therefore a_n = \frac{V_f^2}{\rho} = \frac{200.9^2}{1000} = 40.36\frac{m}{s^2}$

$a_t = 12\frac{m}{s^2}$

FBD:



$\Sigma\vec{F} = m\vec{a}$

$\Sigma F_n = ma_n = \frac{mv^2}{\rho}$

$F_n - W\cos 30° = \frac{mv^2}{\rho}$

$F_n = W\cos 30° + \frac{mv^2}{\rho}$

$= 882.9\cos 30° + 90(40.36)$

$= 4397\ N$

$= 4.397\ kN$

$\Sigma F_t = ma_t = m\dot{v}$

$F_t - W\sin 30° = m\dot{v}$

$F_t = W\sin 30° + m\dot{v}$

$= 882.9\sin 30° + (90)(12)$

$= 1521\ N$

$= 1.521\ kN$