Equation Sheet--EXSC 365

Linear Kinematics

$d = p_2 - p_1$ $\quad v = \frac{p_2 - p_1}{t_2 - t_1}$ $\quad a = \frac{v_2 - v_1}{t_2 - t_1}$ $\quad \text{speed} = \frac{\Delta\text{distance}}{\Delta\text{time}}$

Projectile Equations

$v_2 = v_1 + at$ $\quad d = v_1 t + \frac{1}{2}at^2$ $\quad v_2^2 = v_1^2 + 2ad$

$\text{Maximal Height} = \frac{(v_1)^2}{-2g}$

$\text{Time of Flight} = \frac{(2v_1)}{-g}$ $\quad \text{Time of Flight} = \frac{-v_1 - \sqrt{v_1^2 - 2gh}}{g}$

Linear Kinetics

$F = ma$ $\quad \text{Weight} = \text{mass} \cdot g$ $\quad F_F = \mu \cdot F_N$ $\quad$ Linear Momentum: $L = mv$

Conservation of L: $m_A v_A = m_B v_B$ $\quad$ Static Equilibrium: $\sum F = 0$;

Coefficient of restitution: $e = \sqrt{\frac{bounceheight}{dropheight}}$ or $e = \frac{v_2 - v_1}{u_1 - u_2}$

Impulse/Momentum: $F\Delta t = m\Delta v$ $\quad$ A version of the conservation of L: $m_1u_1 + m_2u_2 = m_1v_1 + m_2v_2$

Work, Power, & Energy

$U = Fd$ $\quad KE = \frac{1}{2}mv^2$ $\quad GPE = m|g|h$ $\quad SE = \frac{1}{2}k\Delta x^2$

$U = \Delta KE + \Delta GPE + \Delta SE$ $\quad P = \frac{U}{t} = Fv$

Angular Kinematics

$\omega = \frac{\Delta\theta}{\Delta t}$; $\quad \alpha = \frac{\Delta\omega}{\Delta t}$; $\quad d = \theta r$; $\quad v = \omega r$; $\quad a_T = \alpha r$; $\quad a_r = \omega^2 r$; $\quad a_r = \frac{v^2}{r}$

Angular Kinetics

Static Equilibrium: $\sum T = 0$

$T = F \times r$; $\quad I = mk^2$; $\quad H = I\omega$; $\quad T\Delta t = I\Delta\omega = \Delta H$; $\quad Fc = \frac{mv^2}{r} = mr\omega^2$; $\quad T = I\alpha$

Fluid Mechanics

$F_{Drag} = \frac{1}{2}C_D\rho Av^2$ $\quad F_{Lift} = \frac{1}{2}C_L\rho Av^2$

Conversions

1 lb = 4.45 N	1 mile = 1609 m	1 m = 3.28 ft	1 kg = 2.214 lb

1 radian = 57.3 degrees