Answers Exam 3 2008

2. a) $v_B = \sqrt{2gH + v_0^2}$

b) $$\begin{cases} (m_1 + m_2)\, v_B = m_2 v_1 \cos\theta_1 + (m_1 + m_3)\, u_x \\ 0 = m_2 v_1 \sin\theta_1 + (m_1 + m_3)\, u_y \\ x = u_x T \\ y = u_y T \end{cases}$$

3. a) $$\omega = \frac{m_1 H^2 + m_2 (H+S)^2}{m_1 H^2 + m_2 (H+S-ct^2)^2}\, \omega_0$$

b) $$F_r = m_2\left(\frac{d^2 r}{dt^2} - r\omega^2\right) \qquad \frac{dr}{dt} = -2ct$$
$$F_\theta = m_2\left(2\frac{dr}{dt}\omega + r\alpha\right) \qquad \frac{d^2 r}{dt^2} = -2c$$

$$\alpha = \frac{4\omega c m_2 t (H+S-ct^2)}{m_1 H^2 + m_2 (H+S-ct^2)^2}$$

c) $$\omega(t) = \frac{m_1 H^2 + m_2 (H+S)^2 + I_{rod}}{m_1 H^2 + m_2 (H+S-ct^2)^2 + I_{rod}}\, \omega_0$$

4. a) $\vec{L} = \mu R^2 \sqrt{\frac{\gamma q_1 q_2}{\mu R^3}}$ ⊙

b) $KE = \frac{\mu}{2}\left(c_1^2 + r^2 c_2^2\right)$

c) $W = \gamma q_1 q_2 \left(\frac{1}{2R} - \frac{1}{R}\right)$