Answers Exam 2 2019

1. $U = \frac{C_1 x^2}{2} + \frac{C_2 x^4}{4} + \text{Const}$

$$KE = \frac{C_1 A^2}{2} + \frac{C_2 A^4}{4} + \frac{m v_1^2}{2} - \frac{C_1 A^2}{8} - \frac{C_2 A^4}{64} =$$

$$= \frac{3}{8} C_1 A^2 + \frac{15 C_2}{64} A^4 + \frac{m v_1^2}{2}$$

2. $v_2 = \sqrt{\frac{1}{m}\left(-\frac{5}{4}\mu_0 L\left(mg\cos\theta + P\sin\theta\right) + mg\sin\theta L - P\cos\theta L\right)}$

3. $M v_p - m_s v_1 \cos\theta_1 = M u_p + m_s v_f \cos\theta_f$

$$0 - m_s v_1 \sin\theta_1 = 0 - m_s v_f \sin\theta_f$$

$$\frac{M v_p^2}{2} + \frac{m_s v_1^2}{2} = \frac{M u_p^2}{2} + \frac{m_s v_f^2}{2}$$

4. a) $v_1 = \sqrt{\frac{2}{m}\left(\frac{k_1 A^2}{2} - mgA\sin\theta\right)}$

b) $H = \frac{1}{g}\left(\frac{v_1^2}{2}\sin^2\theta + gA\sin\theta\right)$

c) $B = \sqrt{\frac{2}{k_2}\left(\frac{k_1 A^2}{2} - mgH\right)}$