

ME 5550 Intermediate Dynamics

Exercises #6 Answers

1. a) $\underline{H}_G = \frac{mab\omega}{12(a^2 + b^2)} (2ab \underline{i}' + (a^2 - b^2) \underline{j}')$

b) $K = ma^2b^2\omega^2/12(a^2 + b^2)$

2. a) $\underline{H}_G = ma^2\omega \left(-\frac{3}{2} \underline{i}' + \frac{1}{2} \underline{j}' + \frac{10}{3} \underline{k}' \right)$

b) $K = \frac{5}{3}ma^2\omega^2$

3. a) $\underline{H}_G = \frac{1}{12}m\ell^2 \left[-(\Omega S_\theta C_\theta) \underline{i}' + \omega \underline{j}' + (\Omega S_\theta^2) \underline{k}' \right]$

b) $K = \frac{1}{24}m\ell^2 (\omega^2 + \Omega^2 S_\theta^2)$

4. a) $\underline{H}_G = \frac{1}{12}m\ell^2 \left[\dot{\theta} \underline{i}' + (\Omega S_\theta C_\theta) \underline{j}' + (\Omega S_\theta^2) \underline{k}' \right]$

b) $K = \frac{1}{2}m \left(b\Omega + \frac{1}{2}\ell\Omega S_\theta \right)^2 + \frac{1}{6}m\ell^2 \dot{\theta}^2 + \frac{1}{24}m\ell^2 \Omega^2 S_\theta^2$
 $= \frac{1}{2}mb \left(b + \ell S_\theta \right) \Omega^2 + \frac{1}{6}m\ell^2 (\omega^2 + \Omega^2 S_\theta^2)$