

1. Proved that the Central Force Field Is a conservative force. (10 %)
2. The moving gear A having a radius of r_2 rotates about the fixed gear B of radius r_1 as shown in Fig. 1. The angular velocity of the connecting rod of length L is ω_1 . What is the velocity of point on gear A expressed in the e_r, e_θ coordinate system? Neglect the gear teeth. (20%)

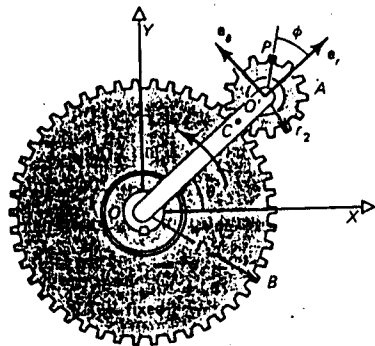


Fig. 1

3. A particle riding on a frictionless circular wire of radius $a/2$ is attached to a spring as shown in Fig.2. When the particle is at position A, the spring is unstretched and its velocity is $v_A = (ag)^{1/2}$. Find the velocity of the body in position B.

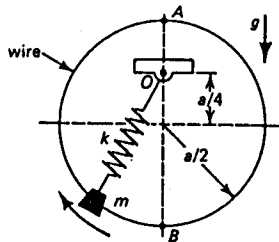


Fig.2

- 4) A 20-lb rod AB is dropped onto a massive body as shown in Fig. 3. What is the angular velocity of the rod after impact for the following conditions:
- a) Smooth floor; elastic impact, (15%)
 - b) Rough floor (no slipping); plastic impact. (15%)

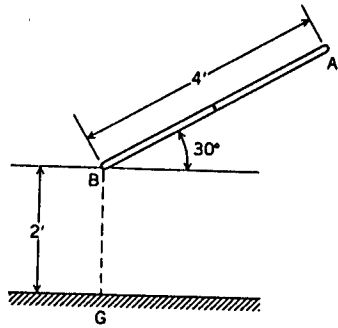


Figure 3. Falling rod on a massive body

- 5) What is magnification factor? Draw the response curve (magnification factor -- driving frequency) of a one dimensional damped force vibration system. (20%)