

Homework 9

The surface of a cam is expressed by a logarithmic spiral formula $r = ke^{0.05\theta}$ mm, where θ is in radians. Due to the uncertainty in the manufacturing process of the cam, the coefficient k follows a normal distribution of $k \sim N(42, 0.5^2)$. The cam rotates at a constant angular velocity of $\omega = 2$ rad/s. Determine the distribution of the velocity and the acceleration of the point on the cam that contacts the follower rod AB at the instant $\theta = \frac{\pi}{3}$. If the allowable acceleration of AB is $a = 186$ mm/s², find the probability of failure of the system.

(Ans. $v_c \sim N(88.63, 1.06^2)$ mm/s, $a_c \sim N(175.9, 2.09^2)$ mm/s², $p_f = 7.1278 \times 10^{-7}$)

