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Engineering Design Shigley 9th Edition Solutions

Chapter 1

Problems 1-1 through 1-4 are for student research.

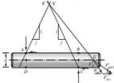
1-5

Impending motion to left



Consider force F at G , reactions at B and D . Extend lines of action for fully-developed friction DE and BE to find the point of concurrency at E for impending motion to the left. The critical angle is θ_c . Resolve force F into components F_{\cos} and F_{\sin} . F_{\cos} is related to mass and acceleration. Pin accelerates to left for any angle $\theta < \theta_c = \theta_c$. When $\theta = \theta_c$, no magnitude of F will move the pin.

Impending motion to right



Consider force F at G , reactions at A and C . Extend lines of action for fully-developed friction AE and CE to find the point of concurrency at E for impending motion to the right. The critical angle is θ_c . Resolve force F into components F_{\cos} and F_{\sin} . F_{\cos} is related to mass and acceleration. Pin accelerates to right for any angle $\theta < \theta_c = \theta_c$. When $\theta > \theta_c$, no magnitude of F will move the pin.

The intent of the question is to get the student to draw and understand the free body in order to recognize what it teaches. The graphic approach accomplishes this quickly. It is important to point out that this understanding enables a mathematical model to be constructed, and that there are two of them.

This is the simplest problem in mechanical engineering. Using it is a good way to begin a course.

What is the role of pin diameter d ?

Yes, changing the sense of F changes the response.