2.72 Elements of Mechanical Design

Homework #6
3D Mechanism Synthesis, Journal Bearings, Rolling Element Bearings

Due Date: Thursday 6 April, 2:30PM

Deliverable: Individual written report (about five pages)

Time allotment: You should expect to spend 5 hours on this homework.

Assignment:

1) Synthesize an RRSS path generation mechanism that follows a path specified by the following 5 points: (6, 7.5, 8.7) (7, 6.9, 8.8), (8, 6.3, 8.7), (9, 5.7, 8.4), (10, 4.9, 7.8). If possible, set the fixed joint locations at (2.15, 7.6, 2.72) and (11.35, 5.5, 1.3).

2) A full journal bearing has a diameter of 1.25 inches, is 2.5 inches long, runs at 1150 rpm, has a radial clearance of 0.001 inch, and employs oil with a viscosity of 10 μreyn.

a) Estimate the power loss due to shearing of the oil when the bearing supports no load.
b) Determine the bearing characteristic number (aka the Sommerfeld number) when the bearing supports 400lbs.
c) Find the eccentricity ratio and minimum film thickness when the bearing supports 400lbs.
b) Estimate the power loss due to shearing of the oil when the bearing supports 400lbs.

3) [Problem removed for copyright reasons. See Problem 11-1, gear-driven squeeze roll mated with idler roll, in Shigley and Mischke 6th ed.]