Universidad Europea de Madrid

Fluid Mechanics II

Homework 2

Due on September 26, 2016

**Problem 1**

Repeat the analysis of the problem of lubrication done in class for a parabolically varying gap

 $h\left(x\right)=h\_{l}+ \left(h\_{0}-h\_{l}\right)\left(1-\frac{x}{L}\right)^{2}$

Solve for the pressure distribution. Plot the resulting pressures for various hl/h0

**Problem 1**

Analyze the problem of creeping flow between parallel disks of radius R and separation distance h. The lower disk z=0 is fixed and the upper disk z=h rotates at angular rate ω. Assuming that vө=r.f(z),reduce the problem as far as possible and solve for the velocities.

**Problem 3**

The viscosity of honey as a function of temperature is shown in the table. The specific gravity of the honey is about 1.42, and is not a strong function of temperature. The honey is squeezed through a small hole of diameter d=5.0mm in the lid of an inverted honey jar. The room and honey are at T=20°C. Estimate the maximum speed of the honey through the hole such that the flow can be approximated as creeping flow. Assuming Re less than 0.1 for the creeping flow. Repeat the calculation if the temperature is 30°C. Discuss the results.

Viscosity of the honey

|  |  |
| --- | --- |
| Temperature (°C) | μ (gr/cm.s) |
| 14 | 600 |
| 20 | 190 |
| 30 | 65 |
| 40 | 20 |
| 50 | 10 |
| 70 | 3 |