Elmansoura university	TRIBOLOGY	Master Preparatory in Design
Faculty of Engineering	Code 4786	Time Allowed 3 hours
Dep. of Design En		Exam 2013

Problem Number 1 (15)Marks

Typical SAE oils where viscosity at other temperatures can be found from an ASTM chart .

Their specific gravity is 0.9,specific heat 0.45, and the viscosities are:-

SAE NO.	30	50
viscosity at 100 F,cS	115	230

Give the viscosities of SAE 30,SAE 50 OILS in Reyns,and kilograms meter hour units at 100^0 F.

Also the pressure-viscosity coefficient in $(lb/in^2)^{-1}$.

Why is a knowledge of this important in lubricant theory?

Problem Number 2 (15)Marks

Derive Reynolds equations in three dimensions, through your derivation writing up all assumptions, simplification and boundary conditions, physical meaning

Problem Number 3 (15)Marks

Drive an equation for friction in sliding bearing that is at the top and bottom surfaces. Where the friction on the moving lower surface is greater than the upper fixed surface.

Problem Number 4 (15)Marks

For Elastohydrodynamic film thickness in three dimension explain:-

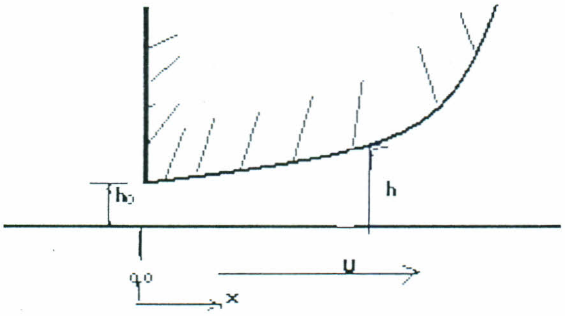
1-point of contact 2-side leakage 3-fatigue failure

Problem Number 5 (15)Marks

Write a discussion on the various friction theories

Problem number 6 (25)Marks

For exponential film, see below drawing diagram of exponential wedge to the right of the origin .



For diverging exponential wedge see drawing diagram

Put the boundary conditions

Let α is the exponential factor which has units of length^{-1} $(L^{-1})$and for Reynolds equation in one dimension which is equal to:-

$$dp/dx = 6U\eta (h-\bar{h})/h^3$$

Replace

$\bar{h}$ by $h_0 e^{-\alpha x}$ h by $h_0 e^{-\alpha x}$ and

prove that the pressure distribution" p " for the exponential film is equal to:-

$$p=-3U\eta [e^{-2\alpha x} - e^{-3\alpha x}]/(\alpha h_0^2)$$

مع تحيات أ.د.عبد الله سند الطوخى