Department of Mechanical Engineering, IIT Kharagpur – 721 302, INDIA

Mid Spring Semester Postgraduate Examination 2016-2017

Subject: Lubrication and Rotor Dynamics (ME 60404)

Time: Two hours **Full Marks:** 30

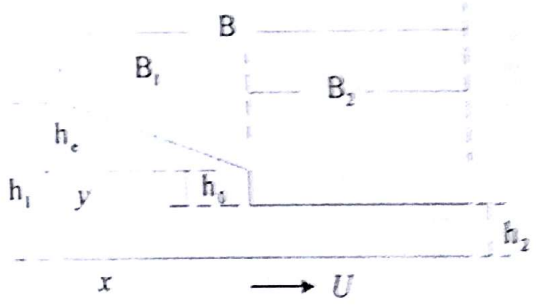
Instruction: Answer all questions. All questions carry equal credit. Assume suitable data wherever necessary.

1. State and explain various properties of lubricant. What is Viscosity Index (V.I.)? How do you find V.I. of an oil?

2. (a) Derive the Reynolds equation using control volume approach.
(b) Explain the boundary and cavitation conditions used in the numerical solution of hydrodynamic journal bearings.

3. The following data relate to an infinitely long fixed shoe slider bearing.
B = 75mm, L = 100mm, U = 3m/s, $\eta = 0.025$ Pa-s, $h_2 = 0.03$ mm
This bearing is to support a load of 2.5kN. Find power loss due to viscous friction.

4. Find pressure distribution at the common boundary of the composite slider as shown below.



5. A full journal bearing has the following specifications:
D = 75mm, L = 65mm, C = 0.05mm, N = 1500rpm, W = 25kN
Determine the average viscosity of lubricant if the minimum film thickness does not exceed 0.001mm. Neglect end leakage and use full Sommerfeld boundary condition.