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**M.Tech.**

**INDUSTRIAL TRIBOLOGY**

**SUBJECT CODE : PE - 512(Elective - I)**

**Paper ID : [E0449]**

[Note : Please fill subject code and paper ID on OMR]

**Time : 03 Hours**

**Maximum Marks : 100**

**Instruction to Candidates:**

- 1) Attempt any **Five** questions.
- 2) **All** questions carry equal marks.

**Q1)** (a) Discuss in detail the surface energy and flash temperature theory.

(b) Differentiate between the rubbing and sliding motion.

**Q2)** (a) Discuss the laws of rolling friction. Suggest some laws of sliding friction analogous to those of rolling friction.

(b) Explain the dynamometer method used to measure sliding friction.

**Q3)** (a) What is wear? Explain the laws of wear.

(b) Explain with neat sketches the classification of wear measuring machines.

**Q4)** (a) Derive the Reynold's equation in 3D flow, giving the various assumptions used for deriving the same.

(b) Explain in detail the mechanism of lubrication.

**Q5)** Design the journal bearing for a centrifugal pump. The diameter of bearing is 0.1 m, the load on it is 50 kN and its speed is 1000 rev/min. Assume any required data.

**Q6)** (a) How rolling bearings are lubricated with grease? Discuss the factors on which the relubrication interval of a roller bearing depends.

(b) Discuss the different modes of bearing failure.

**Q7)** (a) Suggest some methods to prevent and control friction in machines.

(b) Describe the situations which make liquid lubricant undesirable and ineffective which makes us to use solid lubricants.

**Q8)** Write short notes on:

(a) Measurement of fluid film thickness.

(b) Lubrication in rolling.

(c) Limitations of hydrodynamic bearing.

(d) Elasto-hydrodynamic lubricant.

