## BACHELOR OF ENGINEERING IN PRODUCTION ENGGINEERING EXAMINATION, 2019

(4$^{th}$ Year, 2$^{nd}$ Semester)

### TRIBOLOGY

Time: Three hours                                                                                    Full Marks: 100

Answer any *five* questions.

1.  (a)  Derive the co-efficient of ploughing or grooving component of friction for three basic asperity shapes (Sphere, cylinder, and cone)                                  15
    (b)  What is solid lubricant?                                                            5

2.  (a)  Elucidate the importance of studying "stribeck curve".                     10
    (b)  What is Tribology? Discuss its role in Industry.                             2+8

3.  (a)  Explain Hertzian contact stress                                                  5
    (b)  Discuss characteristics of contact stress.                                    5
    (c)  Elucidate contact mechanics with examples                                10

4.  A machine journal bearing has a journal diameter of 150 mm and length of 120 mm. The bearing diameter is 150.24 mm. It is opening with SAE 40 oil at 65°C. The shaft is carrying load of 8kN and rotates at 960 r.p.m. Estimate the bearing co-efficient of friction and power loss. Show the derivative of each equation used by you for solving the problem. Also state the assumption.                    20

5.  A journal of stationary oil engine is 80 mm in diameter and 40 mm long. The radial clearance is 0.060 mm. It supports a load of 9 KN when the shaft is rotating at 3600 rpm. The bearing is lubricated with SAE 40 oil supplied at atmospheric pressure and average operating temperature is about 65°C. Assuming that it is working under steady state condition, determine
    (i)  Co-efficient of friction
    (ii)  Flow requirement in litres/min
    (iii)  Minimum oil film thickness
    (iv)  Maximum film pressure developed in the oil film
    (v)  Heat generated due to friction
    (vi)  Power wasted in friction                                                          20

6.  (a)  Explain the following:
    (i)  Hypothesis of Holm model
    (ii)  Hypothesis of Burwell and Strang model                                    10
    (b)  Discuss Rabinowicz's quantitative law for abrasive wear.              10

7. Elucidate tribological investigation of sputtered polymied and bronge reinforced PTFE films on Ti-6Al-4V substrate against steel in varying environments. 20