Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

VII SEMESTER B.TECH. (AUTOMOBILE ENGINEERING)

END SEMESTER EXAMINATIONS, NOV/DEC 2020

SUBJECT: ENGINE TRIBOLOGY [AAE 4019]

REVISED CREDIT SYSTEM
(01/01/2021)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.

1A.	Using relevant equations, prove that friction coefficient is equal to the ratio of strength of junctions to the yield strength of the material.	**(04)**
1B.	Considering a conical asperity, explain the ploughing theory of friction using appropriate equations.	**(03)**
1C.	List the limitations in the friction theory proposed by Amontons.	**(03)**
2A.	What is Adhesive wear? Mention the applications where adhesive wear is common. Derive the Archard's equation of wear considering a hemispherical wear particle under sliding contact.	**(04)**
2B.	Explain cavitation erosion type of wear.	**(03)**
2C.	Explain any two methods of wear debris analysis.	**(03)**
3A.	State all the conclusions made by Beauchamp Tower from his experiment on journal bearings.	**(04)**
3B.	Explain the property: a) Oxidation stability b) Neutralization number with respect to a lubricant.	**(03)**
3C.	When are the usage of solid lubricants preferred? Which are the commonly used solid lubricants? Mention also the applications where solid lubricants are used.	**(03)**
4A.	How are the ball bearing failures such as corrosion, fatigue failure and reverse loading; detected, caused and mention the possible method for prevention.	**(04)**
4B.	Explain some of the features of non – metallic bearings which are popularly used as journal bearings.	**(03)**

4C.	Explain the Physical Vapour Deposition through evaporation technique using a schematic sketch.	**(03)**
5A.	Derive the Petroff's equation for power loss mentioning the required assumptions and drawing the schematic sketch.	**(04)**
5B.	Derive the expression for the load capacity for rectangular plate subjected to squeeze film action between the plates with breadth *b* and length *l*.	**(03)**
5C.	A hydrostatic circular step thrust bearing has the following data: shaft diameter = 300 mm, diameter of recess = 200 mm, shaft speed = 100 rpm, pocket pressure = 500 kN/m^2, Film thickness = 0.07 mm, viscosity of the lubricant = 0.05 Pa s. Find (i) load carrying capacity (ii) Oil flow rate (iii) power loss.	**(03)**