
MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

VII SEMESTER B.TECH. (AUTOMOBILE ENGINEERING)

END SEMESTER EXAMINATIONS, NOV/DEC 2018

SUBJECT: ENGINE TRIBOLOGY [AAE 4019]

REVISED CREDIT SYSTEM

(01/12/2018)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

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

1A. Elucidate on the importance of formulating spherical deformation theory when conical deformation theory is adequate to determine the coefficient of friction. **(02)**

1B. Illustrate and explain the different testing methods conducted to characterize the two important traits of quasi-solid lubricants **(03)**

1C. Distinguish between wear and friction. Describe the different types of wear mechanisms. Also, describe the dissimilarity in wear mechanisms. **(05)**

2A. How are Rotational viscometers different from efflux viscometers? Mention the prominent features of both the viscometers. **(02)**

2B. Deduce the value of Petroff's coefficient of friction of a journal bearing. How does this friction be beneficial in realizing the different zones of lubrication? **(03)**

2C. The basic dynamic radial load rating (C_r) of a ball bearing is 550N. The bearing consists of 6 balls which are having a diameter of 1.6mm. The speed at which the bearing rotates is measured to be 3600 rpm. If the radial load and the axial load detected is 7N and 9N respectively, calculate the dynamic equivalent rating. Determine the Basic Life Rating of the bearing, if the inner race is in the rotation. **(05)**

(Use Table-1)

3A. Classify gross slip. Explain the importance of gross slip in adhesion wear. **(02)**

3B. Explain the concept of oil whirling. Justify that the hydrodynamic instability is the half speed of the rotational speed of the bearing. **(03)**

3C. Categorize the different types of fluids. Compare their salient attributes by giving suitable examples and show the performance of the fluids when these are subjected to different strain rates. **(05)**

4A. Differentiate between Scanning Electron Microscope and Transmission Electron Microscopy. Why is Tungsten used as filament in SEM? **(02)**

4B. Illustrate and explain the topics given below. **(03)**

I. Roughness and Waviness Spacing

II. Lay and Flaw

4C. Compare the working of an Atomic Force Microscope with the working of a Surface profilometer neat sketches. **(05)**

5A. Derive the velocity in terms of pressure using conservation of momentum of two dimensions which will be used in expressing Reynolds fluid film lubrication. **(07)**

5B. Indicate and justify the assumptions used while deriving the velocity expression of Reynolds equation. **(03)**

Table - 1

Relative Axial Load		Fa/Fr < e		Fa /Fr > e	
(N)	e	X	Y	X	Y
0.172	0.19	1	0	0.56	2.3
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28				1.55
138	0.3				1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44				1