AME 306 | 2016/2017

FEDERAL UNIVERSITY OF TECHNOLOGY, OWERRI.
SCHOOL OF EINGEERING AND ENGINEERING TECHNOLOGY
DEPARTMENT OF MECHANICAL ENGINEERING
2016/2017 RAIN SEMESTER EXAMINATION
AME 306: MECHANICS OF MACHINES II
INSTRUCTION : ANSWER QUESTION 1 AND 3 OTHERS. TIME: $2^{1/2}$ HRS

1. *(a)* Derive an expression for the power transmitted by a belt assuming the centrifugal tension along the arc of contact between belt and pulley is $Tc=mv^2$
(b) Two pulleys of diameters 500mm and 355mm are connected by a flat belt of mass 0.385kg/m. The distance between the pulley centres and the maximum belt tension on the tight side are 1500 mm and 3850N respectively. Calculate the power transmitted when the larger pulley rotates at 1500 r.p.m. Take $\mu=0.8$

2. *(a)* Examine the hydrodynamic action of a journal bearing
(b) Dicuss the three (3) states of lubrication

3. *(a)* Describe the working principles of a square threaded screw.
(b) The jack of a sports car has a square thread single start screw of 20mm pitch and 60mm mean diameter . knowing that a torque of 40N.m is required to raise an applied load, calculate the force on the lever and the efficiency of the screw. What is the torque to lower load. Take $\mu=0.15$

4.(a) There is need to design a Muff coupling of cast iron material to work with a shaft whose diameter is 2dm (dm stands for diameter) in order to transmit a torque, T using a sleeve length L, if the permissible shear stress, τ_c = 13.98 MPA, determine; (i) sleeve length, L (ii) torque to be transmitted, T
(b) (i) what key features differentiate a rigid coupling from a compensating coupling? (ii) State the factors on which the design /selection of coupling are based.

5. (a) A circular pad braking system operates on the constant pressure assumption and hence requires an actuating force of at least 1.2KN to be effective. If the pad radius is 160mm; Determine : (i) Average constant pressure, P_{av} generated by the system (ii) radial location, r if radial ratio, $\frac{r_i}{r_o}=1.5$
(b) The torque capacity, T_c of a single-plate clutch system is 265Nm at an angular speed of 1200rpm.If the coefficient of friction is 0.3, inner diameter of the plate is 1 dm and maximum pressure between the plates is 87.5 KN/m^2, calculate:
(i)Power generated by the system (ii) outer diameter of the plate (iii) axial force to engage the clutch
(hint: Number of friction surfaces=2)