



TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology
Department of Mechanical & Automotive Engineering
UNIVERSITY EXAMINATION FOR:
Diploma in Mechanical Engineering
EME 2205 : Mechanics of Machines II
END OF SEMESTER EXAMINATION
SERIES: AUGUST 2019
TIME: 2 HOURS
DATE: Pick Date Aug 2019

Instruction to Candidates:

You should have the following for this examination

- *Student I.D. Card & Examination Pass*
- *Answer booklet*
- *Non-Programmable scientific calculator*

This paper consists of **FIVE** questions. Attempt any **THREE** questions.
Maximum marks for each part of a question are as shown.

Do not write on the question paper.

Question ONE

Establish a formula for the maximum torque transmitted by a single plate clutch of internal and external radii r_1 and r_2 if the limiting coefficient of friction μ and the axial spring load is P . Assume that the pressure intensity on the contact faces is uniform. Apply this to determine the time required to accelerate a countershaft rotating at 500 kg and radius of gyration 200 mm to the full speed of 250 rev/min from rest through a single plate clutch of internal and external radii 125 mm and 200 mm respectively, taking μ as 0.3 and the spring load as 600 N. **(20 marks)**

Question TWO

An axial thrust of 50 kN is carried by a plain collar type bearing having inner and outer diameters of 250 mm and 400 mm respectively. Assuming that μ between the thrust surfaces is 0.02 and that the local wear rate of these surfaces is proportional to the rubbing speed, determine the power absorbed in friction at a speed of 120 rev/min.

(20 marks)

Question THREE

- a) Derive the expression for the ratio of belt tensions for a flat belt partly wound round a pulley so that the angle of lap is θ .
- b) A ship is dragged through a lock by means of a capstan and rope. The capstan which has a diameter of 500 mm, turns at 30 rev/min. the rope makes 3 complete turns around the capstan, μ being 0.25 and at the free end of the rope a pull of 100 N is applied. Find the pull on the ship and the power required to drive the capstan.

(20 marks)

Question FOUR

A leather belt 125 mm wide and 6 mm thick, transmits power from a pulley 750 mm diameter which runs at 500 rev/min. the angle of lap is 150° and $\mu = 0.3$. If the mass of 1 m^3 of leather is 1 Mg and the stress in the belt is not to exceed 2.75 MN/m^2 , find the maximum power which can be transmitted.

(20 marks)

Question FIVE

- a) Using a suitable sketch explain the following terminologies of gear drives
- Pitch circle diameter
 - Circular pitch
 - Addendum
 - Dedendum
 - Module
- b) A rotating shaft carries four masses A , B , C and D , rigidly attached to it. The centres of mass are at 30 mm, 36 mm, 39 mm and 33 mm respectively from the axis of rotation. A , C and D are 7.5 kg, 5 kg and 4 kg. The axial distance between A and B is 400 mm and that between B and C is 500 mm. The eccentricities of A and C are at 90° to one another. Find for complete balance the:
- angles between A , B and D
 - axial distance between the planes of revolution of C and D
 - mass B

(20 marks)