



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
SPECIAL/ SUPPLEMENTARY 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

A plate clutch consists of a flat driven plate gripped between a driving plate and presser plate so that there are two active driving surfaces, each having an inner diameter 200 mm and an outer diameter 350 mm. $\mu = 0.4$. The working pressure is limited to 170 kN/m².

- Assuming the pressure is uniform, calculate the power which can be transmitted at 1000 rev/min.
- If the clutch becomes worn so that the intensity of pressure is inversely proportional to the radius, the total axial force on the presser plate remaining unaltered, calculate the power which can now be transmitted at 1000 rev/min and
- The greatest intensity of pressure on the friction surfaces.

(20 marks)

Question TWO

A pulley is driven by a flat belt, the angle of lap being 120° . The belt is 100 mm wide by 6 mm thick and has a mass of 1 Mg/m^3 . If $\mu = 0.3$ and the maximum stress in the belt is not to exceed 1.5 MN/m^2 . Find

- the greatest power which the belt can transmit and
- the corresponding speed of the belt.

(20 marks)

Question THREE

- 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 .
- 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

Four masses m_1, m_2, m_3 and m_4 are 200 kg, 300 kg, 240 kg and 260 kg respectively. The corresponding radii of rotation are 0.2 m, 0.15 m, 0.25 m, and 0.3 m respectively and the angles between successive masses are $45^\circ, 75^\circ$ and 135° . Find the position and magnitude of the balance mass required, if its radius of rotation is 0.2 m. (20 marks)

Question FIVE

Two gear wheels of 4.5 module have 24 and 33 teeth respectively. The pressure angle is 20° and each wheel has a standard addendum of 1 module. Find

- The length of arc of contact and
- The maximum sliding velocity if the speed of the smaller wheel is 120 rev/min.

(20 marks)