



MURANG'A UNIVERSITY OF TECHNOLOGY

SCHOOL OF ENGINEERING TECHNOLOGY

DEPARTMENT OF _____

UNIVERSITY ORDINARY EXAMINATION

2023/2024 ACADEMIC YEAR

**THIRD YEAR SECOND SEMESTER EXAMINATION FOR BACHELOR OF
TECHNOLOGY _____**

EET209: MECHANICS OF MACHINES

DURATION: 2 HOURS

INSTRUCTIONS TO CANDIDATES:

1. Answer Question one and any other two questions.
2. Mobile phones are not allowed in the examination room.
3. You are not allowed to write on this examination question paper.

SECTION A: ANSWER ALL QUESTIONS IN THIS SECTION

QUESTION ONE (30 MARKS)

- a) A uniform disc of diameter 300mm and a mass 5kg is mounted on one end of an arm of length 600mm. The other end of the arm is forced to rotate in a universal bearing. If the disc rotates about the arm with a speed of 300r.p.m. clockwise, looking from the front, with what speed will it precess about the vertical axis. (5marks)
- b) With the help of neat sketches describe how to determine the balancing masses and balancing forces when the plane of the disturbing mass lies on one end of the planes of the balancing masses. (5marks)
- c) Explain the four main factors to consider when selecting belt drives (4marks)
- d) A body of weight 70N is placed on a rough horizontal plane. To just move the body on the horizontal plane, a push of 20N inclined at 20° to the horizontal plane is required. Find the coefficient of friction (6marks)
- e) Differentiate between a mechanism and a machine giving relevant examples of each. (4marks)
- f) Depending on the conditions of surfaces, describe the three types of frictions that can exist on surfaces (6marks)

SECTION TWO: ANSWER ANY TWO QUESTIONS

QUESTION TWO (20 MARKS)

- a) A shaft running at 200r.p.m is to drive a parallel shaft at 300rpm. The pulley on the driving shaft is 60cm diameter. Calculate the diameter of the pulley on the driven shaft.
 - i. Neglecting belt thickness
 - ii. Taking belt thickness into account, which is 5mm thick.
 - iii. Assume in the latter case a total slip of 4%
- b) A three link chain mechanism with three joints as shown below. Prove that the chain is locked

QUESTION THREE (20 MARKS)

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

QUESTION FOUR (20 MARKS)

A uniform disc of 150mm has a mass of 5kg. It is mounted centrally in bearings which maintain its axle in a horizontal plane. The disc spins about its axle with a constant speed of 1000rpm while the axle precesses uniformly about the vertical at 60rpm. The directions of rotation is about x-axis. If the distance between the bearings is 100mm, find the resultant reaction at each bearing due to the mass and gyroscopic effects.