



(The University of choice)

**MASINDE MULIRO UNIVERSITY OF
SCIENCE AND TECHNOLOGY
(MMUST)**

**UNIVERSITY EXAMINATIONS
2023/2024 ACADEMIC YEAR**

**YEAR TWO SEMESTER TWO EXAMINATIONS
(Main examination)
ODEL**

BACHELOR OF SCIENCE IN FOOD SCIENCE AND TECHNOLOGY

COURSE CODE: AET 202

COURSE TITLE: ENGINEERING MECHANICS

DATE: 24TH April, 2024

TIME: 8-10 AM

Instructions: This paper consists of 5 questions

Section A is compulsory, Answer any 3 questions from Section B

Observe the regulations governing clean drawing production

SECTION A (25 marks)

Question One

- (a) State the meaning of the following types of motion:
- i. Plane linear
 - ii. Rectilinear
 - iii. Curvilinear
- (3 marks)**
- (b) Giving examples, distinguish between the SI and CGS system of units used in machine mechanics
- (4 marks)**
- (c) State the Newton's laws of motion
- (3 marks)**
- (d) With the aid of a diagram describe the following links:
- i) Binary link
 - ii) Ternary link
 - iii) Quaternary link
- (3 marks)**

Question Two

- (a) With the aid of a well labelled diagram, describe the stress strain diagram for a metallic material.
- (4 marks)**
- (b) Define the following terms
- i) Modulus of elasticity
 - ii) Modulus of resilience
 - iii) Modulus of toughness
 - iv) Factor of safety
- (2 marks)**
- (c) Stating their areas of application, show the distinction between a mechanism, structure and a machine
- (6 marks)**

SECTION B (45 marks)

Question Two

- (a) State what a kinematic pair is and hence with two examples for each give the different classifications of kinematic pairs
- (8 marks)**
- (b) Explain the term inversion of a mechanism and hence show the different configurations with which the mechanism in Figure 1 can be inverted
- (7 marks)**

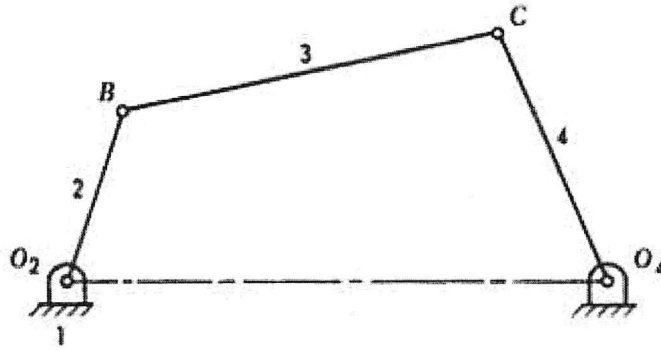


Figure 1

Question Three

(a) Briefly describe, stating their applications, the following types of power transmission devices **(8 marks)**

- i. Belt drive
- ii. Robe drive
- iii. Chain drive
- iv. Gear drive

(b) A shaft which rotates at a constant speed of 170 r.p.m. is connected by belting to a parallel shaft 720 mm apart, which has to run at 60, 80 and 100 r.p.m. The smallest pulley on the driving shaft is 40 mm in radius. Determine the remaining radii of the two stepped pulleys for an open belt. **(7 marks)**

Question Four

(a) Define E, K and G and from first principles show the relationship between them **(9 marks)**

(b) State and describe the different types of stress and strain **(6 marks)**

Question Five

(a) Briefly explain the following terms

- i. Moment of inertia
- ii. Moment of momentum
- iii. Torque
- iv. Couple

(6 marks)

(b) Show the relationship between linear and angular quantities of motion **(4 marks)**

(c) The motion of a particle is given by $a = t^3 - 3t^2 + 5$, where a is the acceleration in m/s^2 and t is the time in seconds. The velocity of the particle at $t = 1$ second is 6.25 m/s , and the displacement is 8.30 metres. Calculate the displacement and the velocity at $t = 2$ seconds. **(5 marks)**