MURANG'A UNIVERSITY OF TECHNOLOGY

SCHOOL OF ENGINEERING TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

UNIVERSITY ORDINARY EXAMINATION

2023/2024 ACADEMIC YEAR

…….. YEAR **SECOND** SEMESTER EXAMINATION FOR, BACHELOR OF SCIENCE IN ……..

EMT 208– MECHANICS OF MACHINES1

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) With the aid of suitable diagrams explain the three types of constrained motion (6marks)
b) State two properties of instantaneous centers (2marks)
c) Give two differences between a machine and a structure (2marks)
d) In a slider crank mechanism, the length of the crank and connecting rod are 100mm and 400mm respectively. The crank rotates uniformly at 600 r.p.m clockwise. When the crank has turned through 45^0 from the inner dead center, find by analytical method
   i) Velocity and acceleration of the slider
   ii) Angular velocity and angular acceleration of the connecting rod (20marks)

SECTION B – ANSWER ANY TWO QUESTIONS IN THIS SECTION

QUESTION TWO (20 MARKS)

The lengths of various links of a mechanism as shown in figure Q2 are: OA=0.3; AB=1M; CD=0.8; and AC=CB. Determine, for the given configuration the velocity of the slider D if the crank OA rotates at 60 r.p.m in the clockwise direction. Also find the angular velocity of the link CD. Use the instantaneous Centre method. (20marks)

QUESTION THREE (20 MARKS)

A steam engine 200mm bore and 300mm stroke has a connecting rod 625mm long. The mass of the reciprocating parts is 15kg and the speed is 250r.p.m. when the crank is at 30^0 to the inner dead center and moving outwards, the difference in steam pressures is $840N/M^2$. If the crankpin radius is 30mm, determine:

i) The force on the crankshaft bearing
ii) The torque at the crank (20marks)

QUESTION FOUR (20 MARKS)

a) With the aid of suitable diagrams, explain how you would balance a single rotating mas using two out of plane masses (5marks)
b) Four masses A,B,C and D are attached to a shaft and revolve in the same plane. The masses are 12kg, 10kg, 18kg and 15kg respectively and their radzz of rotation are 40mm, 50mm, 60mm and 30mm. The angular position of the masses B,C and D are 60^o, 135^o and 270^o from mass A. Find the magnitude and position of the balancing mass at a radius of 100mm (15marks)