TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL ENGINEERING

UNIVERSITY EXAMINATION FOR:

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING

TMC 4212 : MECHANICS OF MACHINES I

END OF SEMESTER EXAMINATION

SERIES: MARCH 2017 SERIES

TIME: 2 HOURS

DATE: Pick Date Mar 2017

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

-Drawing instruments

This paper consists of **FIVE** questions. Attempt any THREE questions.

Do not write on the question paper.

Question ONE

a) **F**ind the angular velocity of the output link when the input rotates at a constant speed of 500 rev/min. Note the diagram is not to scale.FigQ1(a) (13marks)

b) For the slider-crank mechanism provided determine the mobility (degrees of freedom) (7marks)

Question TWO

In the mechanism shown in figure Q2, D is the slider at the end of the link rotating about Centre P and C is a fixed point on AB coincident with D at the instant shown.

OA = 0.6 m, AB = 1.9 m, BQ = 1.0 m and PD = 1.4.If the crank OA rotates anticlockwise at 120RPM, determine the angular velocity of member PD and the speed of sliding at D. (20 Marks)

Question THREE

Locate all the instantaneous centres of the slider crank mechanism shown in figQ3.The lengths of the crank OB and connecting rod AB are 100 mm and 400 mmm respectively. If the crank rotates clockwise with an angular velocity of 10 rad/s, find

i) velocity of the slider A.

ii) Angular velocity of the connecting rod AB. (20 marks)

Question FOUR

a) State THREE considerations for classifying kinematic pairs. For each classification give two examples.

(10 marks)

b) By referring to the plane mechanisms shown in figQ4 apply the Kutzbach criterion to determine the number of degrees of freedom. (10 marks)

Question FIVE

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 B are at 90^0 to one another.

Find for complete balance

a) the angles between A, B and D

b) the axial distance between the planes of revolution of C and D

c) The mass B. (20 marks)