TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology
Department of Mechanical & Automotive Engineering
UNIVERSITY SPECIAL/SUPPLEMENTARY EXAMINATION FOR:
BSc. Mechanical Engineering
EMG 2504 : COMPUTER AIDED DRAWING AND MANUFACTURING
SPECIAL/SUPPLEMENTARY EXAMINATION
SERIES: AUGUST2017
TIME: 2 HOURS

Instruction **to Candidates:**
You should have the following for this examination

- *Answer booklet*
- *Non-Programmable scientific calculator*

This paper consists of **FIVE** questions.
Question **ONE** is **COMPULSORY**
Attempt any other **TWO** questions.
Maximum marks for each part of a question are as shown.
Do not write on the question paper.
Mobile phones are not allowed in the examination room.

Question ONE (COMPULSORY: 30 Marks)

a. Define the terms CAD, CAM and describe the relationship between CAD and CAM giving rise to CAD/CAM. (6 marks)
b. Discuss the following terms in relation with computer systems.
    i. Application Software
    ii. Operating system (4 marks)
c. With the aid of sketches describe the working principle of an LCD Screen display. (4 marks)
d. A point P (1, 0, 0) is translated by a vector $[3\ 4\ 5]^T$. Then it is rotated 30^o about the z-axis, followed by a rotation of 45^o about the x-axis. What are the new coordinates of the point? (6 marks)
e. Describe briefly the purpose of tool compensation and state the TWO types of compensation used on machining centers. (6 marks)

f. Explain the meaning of the following inline keywords:
   i. N5 G92 X-1.000 Y1.000 Z1.000
   ii. N125 G03 X1.000 Y-1.250 R.250 (4 marks)

Question TWO (20 Marks)

a. State the important features of a typical CNC system. (6 marks)
b. Describe the function of MCU and discuss its TWO main components. (5 marks)
c. A drilling operation is to be programmed as:
   i. The tool is positioned at (25.4, 12.5, 0) by a rapid movement.
   ii. The tool is then advanced -10 mm in the z direction at a feed rate of 500 mm/min., with the flood coolant on.
   iii. The tool is then retracted back 10 mm at the rapid feed rate, and the coolant is turned off.

   Write a part program that can be used to effectively achieve the above procedure. (9 marks)

Question THREE (20 Marks)

a) Giving an example in each case, state THREE (3) categories of CAD software systems (6 Marks)
b) Illustrate with sketches the following common assembly constraints:
   i) Mate (2 Marks)
   ii) Insert (2 Marks)
c) List the FOUR (4) common editing errors in robot programming. (6 Marks)
d) A Computer Numerical Controlled (CNC) program consists of function and addresses. Fill in the appropriate identification letter for address against the function, as shown below:

Function	Address
Spindle function	_____
Coordinate word	_____
Parameters for circular interpolation	_____
Preparatory function	_____

(4 Marks)

Question FOUR (20 Marks)

a) What do you understand by the terminology "Computer Numerical Control (CNC)"? (3 Marks)

b) State and briefly describe the following control systems used in a computer numerical machine:

i) Open Loop System

ii) Close Loop System

Which of these systems do most of the modern CNC machines use? (6 Marks)

c) State and briefly describe the six (6) major elements of a CNC system. (12 Marks)

Question FIVE (20 Marks)

a. Distinguish between the following:

i. Absolute and incremental programming

ii. Decimal point and fixed format programming. (8 marks)

b. Prepare manual part program for machining the component with 4 holes of 10 mm diameter on 60 mm P.C.B. as shown in Fig.1 using ISO code. Do not use G41 or G42.

(12 marks)