# MACHAKOS UNIVERSITY

**University Examinations for 2020/2021 Academic Year**

**SCHOOL OF ENGINEERING AND TECHNOLOGY**

**DEPARTMENT OF MECHANICAL AND MANUFACTURING ENGINEERING**

**SECOND YEAR SPECIAL/SUPPLIMENTARY EXAMINATION FOR**

**BACHELOR OF SCIENCE (MECHANICAL ENGINEERING)**

**EMM 200: COMPUTER AIDED DRAWING AND DESIGN**

**DATE: 22/3/2021** **TIME: 2.00-4.00 PM**

**INSTRUCTIONS**

***Answer Question One and Any Other Two Questions***

**QUESTIONS ONE (30 MARKS)**

a) Describe in details the following components of a CAD system.

i. Hardware (3 marks)

ii. Application software (3 marks)

iii. Operating system (3 marks)

b) State three advantages and three disadvantages of CAD over the conventional methods of drawing and design. (6 marks)

c) Describe the functions of the following tools.

i. Array tool (2 marks)

ii. Offset tool (2 marks)

d) Define Layers as used in computer aided design (2 marks)

e) State the functions of the following tabs found at the bottom corner ribbon in AutoCAD.

i. Ortho mode (1 mark)

ii. Snap mode (1 mark)

iii. Grid display (1 mark)

iv. Polar tracking (1 mark)

f) What is the function of a Graphical User Interface (GUI) (2 marks)

g) Define what is a drawing template in CAD (2 marks)

h) State at least two ways of inputting commands on AutoCAD (1 mark)

**QUESTIONS TWO (20 MARKS)**

a) Describe the following types of 3-D modelling techniques. Cite an example of its application, advantages and disadvantages for each.

i. Wire frame modelling (5 marks)

ii. Surface modelling (5 marks)

iii. Solid Modelling (5 marks)

b) Briefly describe the following solid representation schemes.

i. Spatial occupancy enumeration (SOE) (2 marks)

ii. Boundary representation (B-Rep) (2 marks)

c) List any two surface modelling techniques (1 mark)

**QUESTIONS THREE (20 MARKS)**

a) Explain the following 2-D draughting techniques

i. Pixel painting technique (3 marks)

ii. Vector-based technique (3 marks)

b) A line with end points A(2, 3, 2) and B(10, 12, 8) is rotated 60° counter-clockwise about the z-axis, then translated by a vector $[5\ 4\ 8]^T$ and finally scaled by (2, 2, 3). Determine the final coordinates of the line (10 marks)

c) Discuss how to draw figure Q3c using the following point entry techniques

i. Using absolute co-ordinates (2 marks)

ii. Using relative co-ordinates (2 marks)

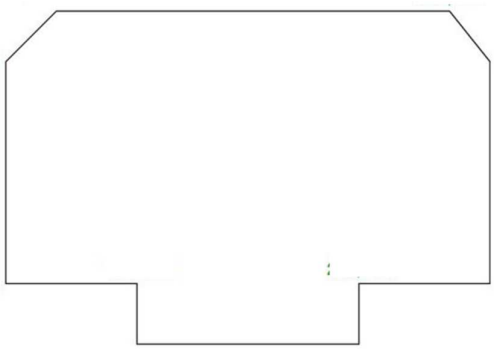

*Figure Q3c*

**QUESTIONS FOUR (20 MARKS)**

a) Explain the procedure of adding text to drawings on AutoCAD (3 marks)

b) Define hatching as used in sectional views (2 marks)

c) Describe how blocks are inserted into other drawings in AutoCAD (3 marks)

d) Outline the steps utilised in constructing the drawings of the objects in the following figures

i. Figure Q4d(i) (6 marks)

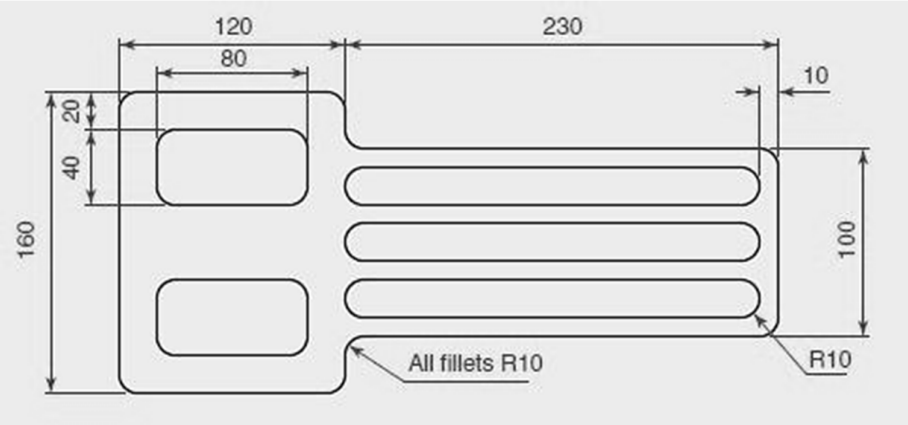


*Figure Q4d(i)*

ii. Figure Q4d(ii) (6 marks)

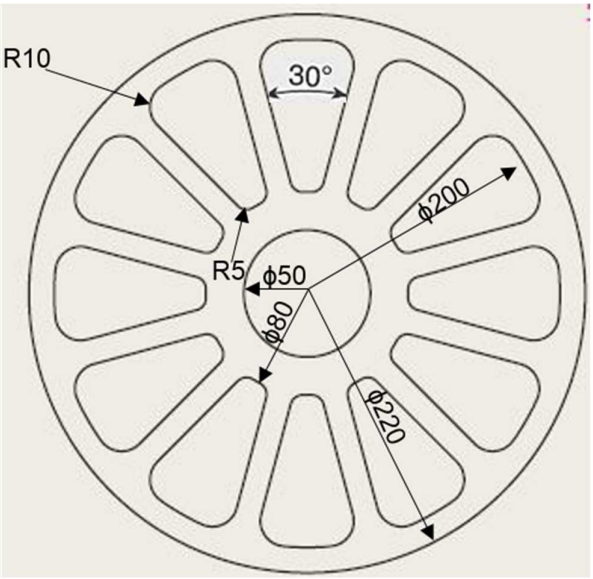


*Figure Q4d(ii)*

**QUESTION FIVE (20 MARKS)**

a) Using diagrams, describe the functions of the following 3-D tools

i. Revolve tool (2 marks)

ii. Lofting tool (2 marks)

iii. Extrude tool (2 marks)

iv. Sweep tool (2 marks)

v. Union tool (2 marks)

b) Outline the steps involved in creating a 3-D solid model from the provided information in figure Q5(d) (10 marks)

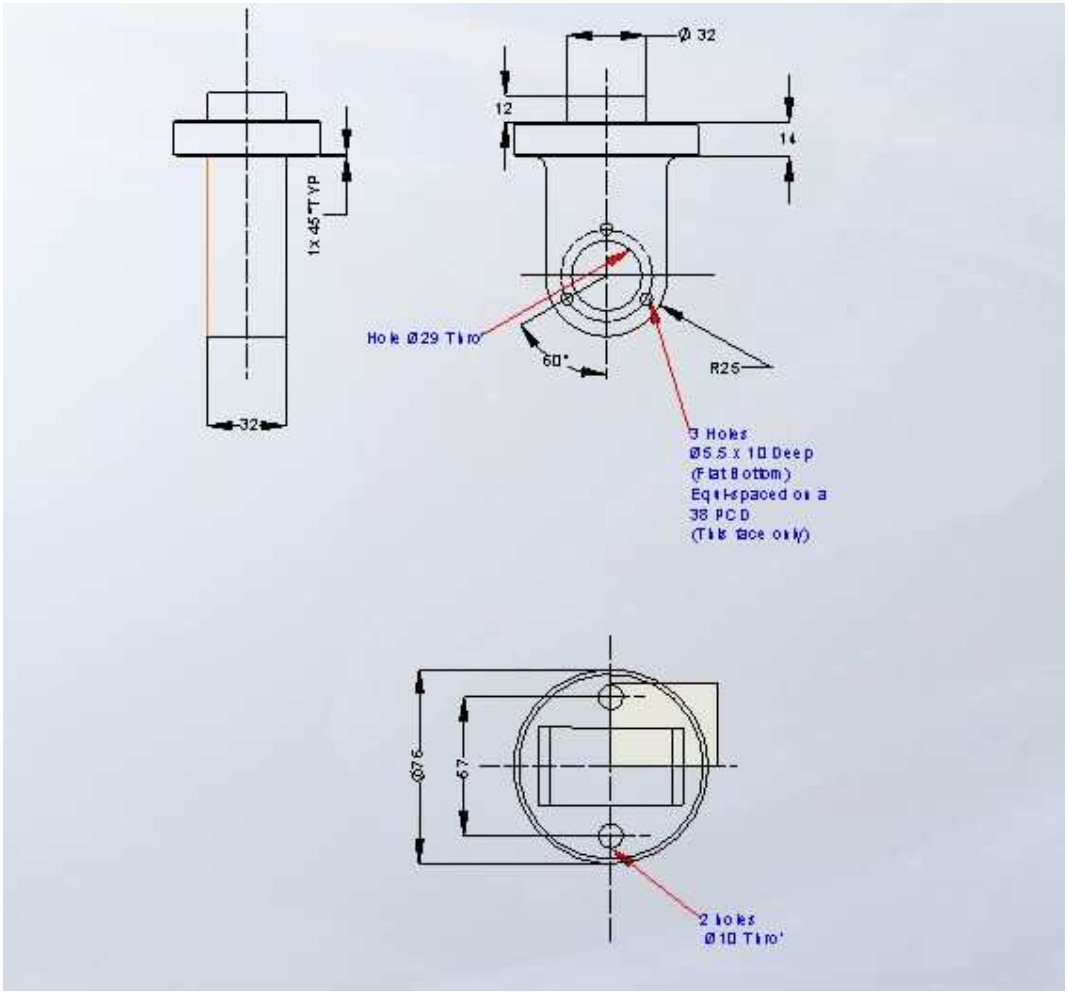


*Figure Q5(d)*