



**TECHNICAL UNIVERSITY OF MOMBASA**  
**Faculty of Engineering & Technology**

DEPARTMENT OF MECHANICAL & AUTOMOTIVE ENGINEERING

UNIVERSITY EXAMINATIONS FOR DEGREE IN  
BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

**EMG 2204: COMPUTER AIDED DRAWING**

END OF SEMESTER EXAMINATIONS

**SERIES: APRIL 2015**

**TIME: 2 HOURS**

**INSTRUCTIONS:**

- This paper consists of FIVE questions.
- All questions carry EQUAL Maximum marks.
- Attempt any THREE questions
- All symbols have their usual meaning unless specified otherwise
- Use clear and neat sketches

***This paper consists of Three printed pages***

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**QUESTION 1 (Compulsory)**

- a) List and discuss **FOUR** features that make Autodesk Inventor a versatile CAD application system. **(8 marks)**
- b) Illustrate with sketches the following common assembly constraints:
- i) Mate **(2 marks)**
  - ii) Mate offset **(2 marks)**
  - iii) Allign **(2 marks)**
- c) An object in space is translated by (5) units in the  $z$ -direction of the world coordinate system and then rotated by  $90^0$  about the  $x$ -axis of the world coordinate system. If a point on the object has coordinates (0, 0, 1) with respect to its model coordinate system, what will be the world coordinates of the same point after the translation and the rotation. **(6 marks)**

## QUESTION 2

- a) Define the word tolerance. **(2 marks)**
- b) Draw a diagram to illustrate each of the following:
- i) Clearance fit **(2 marks)**
  - ii) Transition fit **(2 marks)**
  - iii) Interference fit. **(2 marks)**
- c) Fig. Q.2 shows the sectional assembly of a boss, a bush and a shaft. Normal fit exists between the shaft and bush while press fit exists between the bush and the boss.
- i) Using Data Sheet 4500A (selected ISO fits-Hole Basis) extracted from BS4500 provided, calculate the working limits of shaft diameter, bush hole diameter, bush outer diameter and boss hole diameter (AB). **(8 marks)**
  - ii) Draw the shaft, the bush and the boss illustrating how these limits are dimensioned. (NOTE: Draw each part separately). **(4 marks)**

## QUESTION 3

- a) Figure Q.3 (a) shows a part of a machine to be made. By use of proper symbols, give the following instructions:
- Surface (i) to be finished to an obligatory roughness value of between 0.2 and 0.8 micrometre.
  - Surface (ii) to be finished to an obligatory roughness value of 0.8 micrometre. **(6 marks)**
- b) Figure Q. 3 (b) shows a part of a machine to be made. By use of proper symbols, give instructions: Surface (iii) to be lapped to 0.05 micrometre of the stated diameter circular lay, over a length of 30 mm. **(4 marks)**
- c) Figure Q. 3 (c) shows two views of a part of a machine to be made in 3<sup>rd</sup> angle orthographic projection. By use of proper symbols, give instructions:
- Surface (iv) is to be finished by honing in the direction parallel to plane to N6.
  - Draw projection symbol. **(6 marks)**
- d) Figure Q. 3 (d) shows a part of a machine to be made. By use of proper symbols, give instructions: Surface (v) should be finished to an obligatory radial grinding lay to the limit of N4. **(4 marks)**

#### QUESTION 4

- a) With the aid of sketches, describe the following modeling systems:
- i) Surface modeling systems. **(3 marks)**
  - ii) Solid modeling systems. **(3 marks)**
- b) With the aid of sketches, describe the following types of internal representation scheme used in solid modeling.
- i) Sweeping **(3 marks)**
  - ii) Constructive Solid Geometry (CSG) **(3 marks)**
  - iii) Rounding **(3 marks)**
- c) i) Show how the following object Fig. Q.4 (c) may be represented using CSG.
- ii) What is the main limitation of CSG? **(5 marks)**

#### QUESTION 5

- a) Outline the mathematical principles used in creating the following graphical elements:
- i) Lines **(3 marks)**
  - ii) Circles **(3 marks)**
- b) Name **THREE** widely acceptable standard CAD data exchange formats. **(3 marks)**
- c) Discuss the statement “why can’t the information be completely exchanged between CAD tools” **(5 marks)**
- d) Briefly describe the **FOUR** major phases in the history and evolution of CAD/CAM, stating the major events that characterize each phase. **(6 marks)**