Dedan Kimathi University of Technology

University Examinations **2021/2022**

FIRST YEAR SECOND SEMESTER EXAMINATION FOR DEGREE OF

MASTER OF SCIENCE IN MACHINE TOOL DESIGN & MANUFACTURING

EMM 6108: MOULD FINISHING AND MAINTENANCE

DATE: DEC 2021 **TIME:** 3 HOURS

INSTRUCTIONS

1. **The exam has TWO sections**
2. **Section A is Compulsory**
3. **Choose TWO questions ONLY from section B**

SECTION A: COMPULSORY

Q1.(20Mks)

a) i) List three types of plastic processing and give an example of a product made by each of the identified process. **[3 Marks]**

ii) You are asked to determine the material and manufacturing process, which can deliver mass production of the high voltage switch shown in fig 1(a). Justify the choice made. **[2 Marks]**

Fig 1 (b)

b) With the use of a diagram, briefly explain the Mould making process and discuss the role of the product design in the mould making process. **[4 Marks]**

c) In manufacturing systems design, determining the process choice for a particular product is a very important decision for the Production Engineer. Explain at least THREE key issues that need to be considered while deciding the process choice. **[3 Marks]**

d). A tool manufacturing company would like to start production of injection moulds for mobile phones body frame. With the challenges of mould corrosion, erosion, wear and tear after use, the company would like to use design for maintenance (DFM) approach in their mould's design. Using the RAAMSSHEEP approach, explain how you can implement DFM for an injection mould shown in fig 1d, in relation to the selected critical components of the mould? **[8 Marks]**

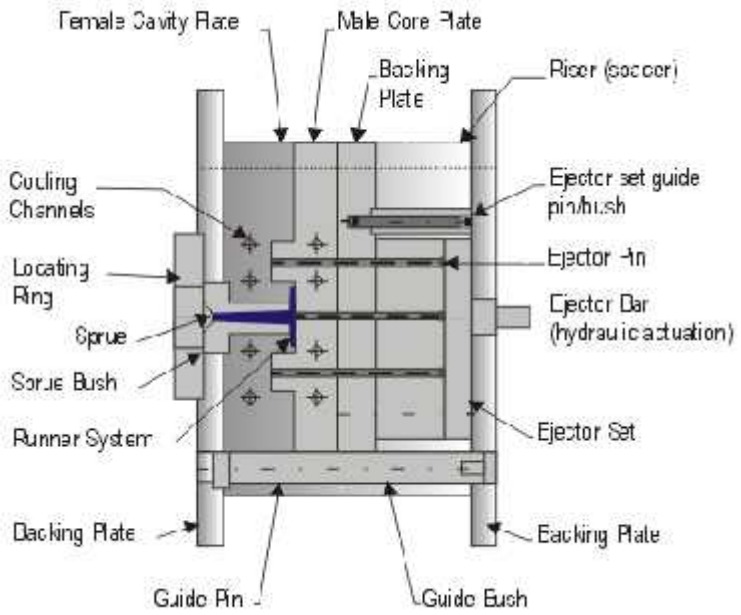


Fig. 1d

SECTION B: ATTEMPT TWO QUESTION ONLY

Q2. (20Mks)

a) Explain the following terms in terms of design and production of precision machine tools like a mould:

i) Dimension **[1 Marks]**

ii) Tolerance **[1 Marks]**

iii) Fit **[1 Marks]**

b) With respect to machine tool design and manufacturing, discuss three (3) reasons why tolerances are necessary. **[3 Marks]**

c) Outline four reasons why variations arises in machining process?

d) With the aid of diagrams, discuss the four main types of Tolerances. For each type of tolerance, identify the component of the mould where each tolerances is applicable. **[8 Marks]**

e) With the aid of diagrams, outline the three major types of fits. Identify components of the mould which may require any type of fitting. **[6 Marks]**

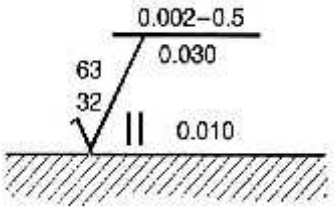
Q3.(20Mks)

a) Surface technology is very important in mould design and manufacturing. Outlines four reasons why surfaces are very important. **[4 Marks]**

b) With respect with product design and manufacturing, explain the following terminologies:
   i. Nominal surface **[2 Marks]**
   ii. Actual Surface **[1 Marks]**

c) With respect surface texture of precisely engineered components;
   i. Differentiate between the term Surface Texture and Surface integrity. **[3 Marks]**
   ii. Further, outline and discuss four elements of surface texture **[7Marks]**

d) The following dimensions describes the roughness specifications of a surface. Identify the meaning of each dimension given. **[3 Marks]**



Q4. (20Mks)

a) Distinguish between the terms metal corrosion and metal erosion. **[2 Marks]**

b) Corrosion provides a very serious challenge to metallic components and lead to eventual destruction of the components/structure.

i. Outline and discuss four Types of Electrochemical Corrosion **[4 Marks]**
ii. In a four plate mould, which types of electrochemical corrosion is likely to occur and why? **[2 Marks]**

c) Corrosion protection is a mandatory requirement for most equipment. With the aid of diagrams, discuss two (2) specific methods of corrosion protection. **[4 Marks]**

d) In order to improve the surfaces of machine components, there are three general classifications of surface treatments.

i. Outline the three general classifications of surface treatments options. **[3 Marks]**
ii. In each general classification, give at least three types of surface treatment and the benefit of each surface treatment? **[3 Marks]**
iii. For a ten cavity injection mould of making Polyethylene (PE) bottle tops, with colour additives, which types of mould surface treatment would you recommend and why? **[2 Marks]**

Q5. (20Mks)

a) Explain the term "Surface Engineering" and outline four (4) purposes of surface engineering. **[4 Marks]**
b) Precision engineered components, like moulds, requires polishing to improve the surface finished on the manufactured products.
   i. Outlines and discuss the four (4) types of polishing quality qualities. Which type of polishing quality would you recommend for a bottle making blow mould? **[4 Marks]**
   ii. List at least four types of polishing materials. **[2 Marks]**
   iii. Various types of polishing defects may be experienced in polished surfaces. Discuss at least three types of polishing defects that are common in moulds. **[4 Marks]**

c) Various maintenance policies exists in practice, to trigger maintenance actions for various critical manufacturing equipment. Discuss at least 3 maintenance policies and explain how they can be used in mould maintenance. **[6 Marks]**