



(University of Choice)

**MASINDE MULIRO UNIVERSITY OF
SCIENCE AND TECHNOLOGY
(MMUST)**

MAIN CAMPUS

**UNIVERSITY EXAMINATIONS
2021/2022 ACADEMIC YEAR**

**FIFTH YEAR FIRST SEMESTER SUPPLIMENTARY/SPECIAL
EXAMINATIONS**

**FOR THE BACHELOR OF SCIENCE
IN
MECHANICAL AND INDUSTRIAL ENGINEERING**

COURSE CODE: MIE 513E

COURSE TITLE: SURFACE TREATMENT OF METALS

DATE: 3 – 10 - 2022

TIME: 12:00 PM – 2:00 PM

INSTRUCTIONS TO CANDIDATES

Question ONE (1) is compulsory
Answer Any Other TWO (2) questions

TIME: 2 Hours

MMUST observes ZERO tolerance to examination cheating

QUESTION ONE**(30 marks)**

- a) Painting is one of the techniques used to surface treat metals. In this regard explain the following methods of paint application **(6 marks)**
- i.* Silk-screening
 - ii.* Electrostatic spraying
 - iii.* Spray coating
- b) Surface hardening processes form a very important part of product manufacture. In this regard, give five (5) reasons why surfaces are hardened **(5 marks)**
- c) List at least four (4) categories of thermal spraying techniques applied in surface treatment of materials **(2 marks)**
- d) State four (4) reasons for which articles are electroplated **(4 marks)**
- e) Surface treatment forms a very important part of manufacture, briefly discuss five (5) applications of surface engineering **(5 marks)**
- f) With regards to wire and cable method of non-metallic coating, state three (3) thermoplastic materials and three (3) thermosetting materials that can be used for insulation **(6 mark)**
- g) Many different effects can occur during oxidation of the alloy composed of the base metal M and alloying element B. Progression of the process depends on the alloy composition, environmental conditions and other influencing parameters. List any two. **(2 marks)**

QUESTION TWO**(20 marks)**

- a) With regards to thermal-chemical treatments and with the use of appropriate diagrams, discuss Nitriding and Carbo-nitriding techniques **(8 marks)**

- b) With regards to thermal spraying techniques and with the use of appropriate diagrams, discuss water plasma spraying and flame spraying
(8 marks)
- c) Every plating bath contains ingredients which serve one or more functions. Briefly discuss the functions of the plating bath
(4 marks)

QUESTION THREE **(20 marks)**

- a) Vapor deposition is one of the widely used techniques in surface treatment of metals. With the use of an appropriate diagram, discuss sputtering technique as one of its processes
(6 marks)
- b) By the use of an appropriate diagram, explain the ion implantation technique **(8 marks)**
- c) With regards to electroplating, discuss the categories of electroplating coatings **(6 marks)**

QUESTION FOUR **(20 marks)**

- a) With regards to wire and cable method of non-metallic coating, discuss the roles of the jacket
(4 marks)
- b) High temperature oxidation can be divided into two limited procedures. Briefly discuss them
(10 marks)
- c) As regards the processes used in surface treatment of metals, discuss mechanical hardening of the surface
(6 marks)

