



(University of Choice)

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

**MAIN CAMPUS**

**UNIVERSITY EXAMINATIONS  
2022/2023 ACADEMIC YEAR**

**FIFTH YEAR FIRST SEMESTER EXAMINATIONS**

**FOR THE DEGREE  
OF  
BACHELOR OF SCIENCE IN ELECTRICAL  
AND  
COMMUNICATION ENGINEERING**

**COURSE CODE: ECE 511**

**COURSE TITLE: ENGINEERING PRODUCT DESIGN**

**DATE: 6<sup>TH</sup> DECEMBER, 2022      TIME: 8: 00 AM – 10:00 AM**

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**INSTRUCTIONS TO CANDIDATES**

ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS.  
QUESTION ONE CARRIES 30 MARKS AND ALL OTHERS 20 MARKS EACH.

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 3 Printed Pages. Please Turn Over. 

**Question One****30 Marks**

- a) Discuss in details the different stages of electronic product design. Explain the implication of skipping a particular stage in development. (10 marks)
- b) What is anthropometry? Why is anthropometrics important in product design? (8 marks)
- c) Explain the role and importance of aesthetics in design? (6 marks)
- d) What is feasibility study? Explain the elements of a feasibility study in product development? (6 marks)

**Question Two****20 Marks**

- a) Documentation is integral to any product. Justify? (4 marks)
- b) Prepare a list of documents and explain in brief about each document to be supplied to a PCB manufacturer for manufacturing a double sided plated through a hole PCB. How can you test a plated through hole PCB? (16 marks)

**Question Three****20 Marks**

- a) Give a brief description of the following:
- i) Crosstalk
  - ii) EMI leakage
  - iii) Thermal management
  - iv) Transient suppressor
  - v) Isolators
- (10 marks)
- b) With the aid of sketch diagrams, explain grounding, shielding and guarding techniques. (10 marks)

**Question Four****20 Marks**

- a) Briefly outline the characteristics of the failure rate curve (Bath-tub curve). (8 marks)
- b) The time-till-failure of a system,  $T$  years, has the probability density function:

$$f(t) = \begin{cases} kt^{-4} & t > 2 \\ 0 & \text{otherwise} \end{cases}$$

If  $k$  is a constant, evaluate the following:

- i) the mean-time-to failure.
  - ii) the mean time till failure.
  - iii) the failure rate.
  - iv) sketch a graph of the failure rate against time. (8 marks)
- c) Ten thousand new oil circuit reclosers (OCRs) are put in service. They have a constant failure rate of 0.1 per year. How many units of the original 10,000 will still be in service after 10 years? How many of the original will fail in Year 10? (4 marks)

**Question Five****20 Marks**

- a) What is electronic enclosure? Why is it an essential requirement in electronic product design? (7 marks)
- b) In order to estimate the stability of the enclosure, various tests are carried. These testes are designed based on the application and the operating environment. Give any three of such tests, their possible outcome and any action to be taken to prevent errors/faults occurring while in operation. (9 marks)
- c) For a military product, it is desirable to achieve 60-dB shielding effectiveness using conductive coating on the enclosure. What would be the coating impedance in  $\Omega/\text{sq. inch}$ ? (4 marks)