



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

**MAIN CAMPUS**

**MAIN EXAMINATIONS  
2021/2022 ACADEMIC YEAR**

**FIFTH YEAR FIRST SEMESTER EXAMINATIONS**

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

**COURSE CODE: ECE 514**

**COURSE TITLE: TRANSMISSION LINES**

**DATE: FRIDAY, APRIL, 22<sup>ND</sup>, 2022  
PM**

**TIME: 12:00 - 2:00**

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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 4 Printed Pages. Please Turn Over.

**SECTION A**

**Question one**

- a) What is transmission line and what purpose does it serve for both transmitter and antenna? (3mks)
- b) The terms electrically long and electrically short as used in transmission line is relative. Use an example to illustrate this. (5mks)
- c) Explain what you understand by incident wave and reflected wave in transmission lines. (4mks)
- d) Define Characteristic impedance. (2mks)
- e) What is a distortionless line? What is the condition for a distortionless line? (4mks)
- f) Why do we use distributed parameters in transmission lines instead of lumped parameters? Briefly explain **any two** distributed parameters used in transmission line. (4mks)
- g) A coaxial line has the following characteristics at 1000MHz:  $R = 4\text{ohms/m}$ ,  $L = 450\text{ nH/m}$ ,  $G = 7 \times 10^{-4}\text{ mho/m}$ ,  $C = 50\text{pF/m}$ .
  - i) Calculate  $Z_0$ ,  $\alpha$ ,  $\beta$ ,  $v$ , and  $\lambda$ .
  - ii) With  $V_o^+ = 10\text{V}$  and  $V_o^- = 0$ , calculate  $V$ ,  $I$ , and  $P$  at  $z = 4\text{m}$ . (8mks)

**SECTION B**

**Question two**

- a) List any four types of transmission lines. (4mks)
- b) Find the VSWR and reflection coefficient of a perfectly matched line with no reflection from load? (4mks)
- b) A  $50\ \Omega$  coaxial cable feeds a  $75 + j20\ \Omega$  dipole antenna. Find reflection coefficient and standing wave ratio. (4mks)
- c) A transmission line operating at 500 MHz has  $Z_0=80\ \Omega$ ,  $\alpha= 0.04\text{ Np/m}$ ,  $\beta=1.5\text{ rad/m}$ . Find the line parameter series resistance ( $R\ \Omega/\text{m}$ ), series inductance ( $L\ \text{H/m}$ ), shunt conductance ( $G\ \text{mho/m}$ ) and capacitance between conductors ( $C\ \text{F/m}$ ). (8mks)

**Question three**

- a) What are nodes and antinodes on a line? (4mks)
- b) What is the application of the quarter wave matching section? (4mks)
- c) When is a system said to be uncontrollable? Give reasons for preferring a short, circuited stub when compared to an open-circuited stub. (4mks)