The Mombasa Polytechnic University College

A Centre of Excellence

Department of Electrical & Electronic Engineering

EEE2314 : TRANSMISSION LINES BSc(6R/6E) TEST1

October 25TH 2012 TIME : 2 Hrs

ATTEMPT ALL QUESTIONS

1. (a) With reference to electric circuits distinguish between
   (i) Lumped circuit model
   (ii) Distributed circuit model (6 marks)
   (b) (i) Distinguish between electrically long and electrically short structures
   (ii) Consider a pair of lands 10cm long etched on a glass –epoxy board ($\varepsilon_r = 4.7$).
   Determine the time delay that a signal suffers as it propagates along these lands.
   (i) Describe with the aid of appropriate sketches why it is necessary to either minimize or eliminate time delay in signal transmission. (8 marks)
   (c) Determine the phase shift that a signal suffers as it propagates over a length of 10cm at
   (i) 1 GHz
   (ii) 2 GHz
   (iii) 3 GHz (6 marks)
2. (a) (i) Apply a step input into an infinitely long transmission line and with appropriate Sketches describe what happens as energy surges towards the end of the line
   (ii) Describe the scenario in (a) (i) assuming the line is terminated in a
   I. Short circuit
   II. Open circuit (9 marks)
   (b) (i) Define the term 'characteristic impedance'
   (ii) Explain the importance of 'controlled impedance' boards and cables in RF design (4 marks)
   (c) A certain lossless coaxial cable has a characteristic impedance of 50Ω Ω and a velocity factor $u = 0.63$ and a capacitance of $90pF/m$. Determine

(i) The wave velocity on this cable in cm/nanosecond

(ii) inductance and capacitance per unit length of the cable

(iii) The wavelength on the cable at a frequency of 1.2GHz

(iv) $\lambda/4$ wavelength section of the cable 7 marks)

3. Explaining each step and justifying any assumptions made show that the voltage and current along a transmission line is given by the following expressions

$$\hat{V}(z) = V_0^{+} e^{-\gamma z} + V_0^{-} e^{\gamma z}$$

$$\hat{I}(z) = \frac{V_0^{+}}{Z_0} e^{-\gamma z} - \frac{V_0^{-}}{Z_0} e^{\gamma z}$$ (20 marks)