MODEL PAPER

14EC504

Hall Ticket Number:

III/IV B.Tech DEGREE EXAMINATION

OCTOBER, 2016 **Electronics and Communication Engineering**

Fifth Semester **EM WAVES AND TRANSMISSION LINES**

Time: Three Hours **Maximum :** 60 Marks

Answer Question No.1 compulsorily. (1X12 = 12 Marks)

Answer ONE question from each unit. (4X12=48 Marks)

1. Answer all questions (1X12=12 Marks)

a. Define transmission coefficient and write an expression for it.

b. Write the properties of reflection and transmission coefficient.

c. Define critical angle and write an expression for it.

d. Draw the equivalent circuit for Transmission line.

e. Write the expression for Z_0 and γ at high frequency.

f. For a Transmission line $Z_0 = 50\Omega, V_{max} = 7V, V_{min} = 2.5V$ .Line is terminated by a purely resistive load. Compute the value of resistance.

g. What is Stub matching?

h. Draw the graph between the VSWR and reflection coefficient.

i. State Snell's law for Reflection and Refraction.

j. What is the difference between the waveguide and guided wave?

k. Why TEM does not exist in rectangular wave guide

l. Write the comparison between the rectangular and circular wave guide.

UNIT – I

2.a The transmission and reflection coefficients are merely a different expression of the interface conditions.TIF. Explain. 4M

2.b What is reflection and transmission .Explain with layered materials at normal incidence? 8M

(OR)

3.a The amplitude of the transmitted wave can be larger than that of the incident wave, the power transmitted across the interface cannot be larger than the incident power. Show why this is so. 4M

3.b What is oblique incidence on dielectric interfaces? Explain with perpendicular and parallel polarization 8M

UNIT – II

4.a Show that for any uniform Transmission line the following equations are valid $Z_0^2 = Z_{oc}Z_{sc}$ and $\tanh^2 \gamma l = \frac{Z_{sc}}{Z_{oc}}$. 4M

4.b Explain types of Transmission lines in detail. 8M

(OR)

5.a Derive the expression for voltage and current on Transmission line when it is terminated with an impedance of Z_R. 6M

5.b Calculate primary and secondary constants of a line of $50Km$ long Z_{oc} and Z_{sc} is measured by an AC bridge at $700MHz$ were found to be $286\angle -40^0$, $1520\angle 16^0$ respectively. The velocity of propagation of the line is assumed as $1.86\times10^5 Km/Sec$. 6M

UNIT – III

6.a Determine reflection coefficient Γ, $VSWR$, Normalizing impedance, Normalizing Admittance, location of V_{max} and V_{min}, matched load using Smith chart for given value of $Z_R = 100 + j200$ and $Z_0 = 500\Omega$. 8M

6.b Why it is necessary to use special techniques when analyzing capacitive or inductive loads. 4M

(OR)

7.a Explain construction of Smith chart and write the procedure to determine l_s and l_t from smith chart. 6M

7.b How can an initial condition on a line be established. 4M

UNIT – IV

8.a Define quality factor of a waveguide and derive an expression for it. 4M

8.b A TE_{10} wave at 10 GHz propagates in a brass $\sigma_c = 1.57\times10^7 s/m$, rectangular waveguide with inner dimensions $a = 1.5cm$ and $b = 0.6.cm$ which is filled with Polyethylene $\varepsilon_r = 2.25$, $\mu_r = 1$, $loss\,tangent = 4\times10^{-4}$ Determine (i).The phase constant (ii).The guide length (iii).The phase velocity (iv).The wave impedance (v). α_c and α_d 8M

(OR)

9.a Starting from Maxwell's equations, derive the field expressions for TE in rectangular wave guide 8M

9.b A Rectangular waveguide $7\times3.5cm$ operates in TE_{10} mode then calculate its cutoff frequency, velocity of propagation at $3.5GHz$ and guide wave length at the same frequency. 4M