

## ONE TIME EXIT SCHEME

USN

--	--	--	--	--	--	--	--	--	--

CMRIT LIBRARY  
BANGALORE - 560 037

10TE54

Fifth Semester B.E. Degree Examination, April 2018  
**Transmission Lines and Waveguides**

Time: 3 hrs.

Max. Marks: 100

**Note: 1. Answer any FIVE full questions, selecting at least TWO questions from each part.**  
**2. Use of Smith chart is permitted.**

**PART - A**

- 1 a. Derive an equation for voltage and current at any point on transmission line. (12 Marks)
- b. A generator of 1 volt, 1000 Hz supplies power to a 100 km open wire line terminated in  $Z_0$  having following parameters. The  $R = 10 \Omega/\text{km}$ ,  $G = 0.8 \times 10^{-6} \text{ S}/\text{km}$ ,  $L = 0.004 \text{ H}/\text{km}$  and  $C = 0.008 \mu\text{F}/\text{km}$ . Calculate the values of  $Z_0$ ,  $\gamma$ ,  $\alpha$ ,  $\beta$  and  $\lambda$ . (08 Marks)
- 2 a. Derive the expression for cut-off frequency and characteristic impedance of constant - K high pass filter - T - Section. (06 Marks)
- b. What are standing waves? Draw the standing wave pattern for:
  - i)  $Z_R = \text{open circuited}$
  - ii)  $Z_R = \text{short circuited}$
  - iii)  $Z_R = 3Z_0$
  - iv)  $Z_R = \frac{Z_0}{3}$
  - v)  $Z_R = Z_0$  (08 Marks)
- c. Define the following terms:
  - i) Reflection coefficient
  - ii) Reflection loss
  - iii) Insertion loss (06 Marks)
- 3 a. Show that the input impedance of OC and SC loss-less transmission lines are purely reactive. (08 Marks)
- b. Obtain the relation between VSWR and reflection coefficient. Find the value of reflection coefficient and VSWR of line having  $R_0 = 100 \Omega$  and  $Z_R = 100 - j100 \Omega$ . (12 Marks)
- 4 a. A load impedance of  $Z_R = 60 - j80 \Omega$  is required to be matched to a  $50 \Omega$  co-axial line, by using a short circuited stub of length ' $l$ ' located at a distance ' $d$ ' from the load. The wavelength of operation is 1 meter. Using Smith chart, find ' $d$ ' and ' $l$ '. (10 Marks)
- b. Obtain the condition for voltage step-up on the resonant line. (05 Marks)
- c. Explain the applications of quarter wave line. (05 Marks)

**PART - B**

- 5 a. State and prove the properties of 'S' parameters. (10 Marks)
- b. Explain the theory of the scattering matrix representation of a multiport network. (05 Marks)
- c. Obtain the relationship between Z, ABCD and S parameters. (05 Marks)
- 6 a. Derive the expressions for propagation constant, cut-off frequency, group velocity, phase velocity for  $TE_{mn}$  mode in rectangular waveguide. (12 Marks)
- b. Explain with neat sketches the construction and operation of precision type variable attenuator. (08 Marks)

CMRIT LIBRARY  
BANGALORE - 560 037

**CMRIT LIBRARY**  
BANGALORE - 560 037

10TE54

- 7 a. Explain the working principle of GUNN diode. (06 Marks)  
b. With a neat diagram explain the construction and principle of operation of IMPATT diode. (08 Marks)  
c. Explain the PIN – diode as single switch. (06 Marks)
- 8 a. Explain the operation of parametric amplifier with equivalent circuit. Also explain MANLEY-ROWE relations. (08 Marks)  
b. Write short notes on the following:  
i) BARITT diode  
ii) Schottky barrier diode  
iii) READ diode (12 Marks)

**CMRIT LIBRARY**  
BANGALORE - 560 037

\* \* \* \* \*