CBCS SCHEME

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17EC71

Seventh Semester B.E. Degree Examination, June/July 2024
Microwave and Antennas

Time: 3 hrs. Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Describe the mechanism and oscillations of Reflex Klystron. **(08 Marks)**

b. Derive the general transmission line equation to find voltage and current on the line. **(08 Marks)**

c. A transmission line working at Radio Frequency has the following constant, L = 9μH/m, C = 16pF/m the line is terminated is a load of 2kΩ. Find : i) characteristics impedance ii) SWR. **(04 Marks)**

OR

2 a. Define Reflection coefficient. Derive the equation for reflection coefficient at the load end at a distance 'd' from the load. **(08 Marks)**

b. What are standing waves? Derive the equation of VSWR and write the relationship between VSWR and reflection coefficient. **(08 Marks)**

c. A transmission line has following parameters R = 2Ω/m, G = 0.5mmho/m, f = 1GHz, L = 8nH/m, C = 0.23pF/m, calculate :
i) Characteristics impedance
ii) Propagation constant **(04 Marks)**

Module-2

3 a. List the properties of S-matrix and briefly explain any four. **(10 Marks)**

b. Explain with relevant diagrams, applications and operations of magic tee. **(10 Marks)**

OR

4 a. Compare Low frequency and microwave frequency networks. **(08 Marks)**

b. Discuss about different types of co-axial connectors. **(04 Marks)**

c. With a neat diagram, explain the working of precision type variable attenuator. **(08 Marks)**

Module-3

5 a. Explain Radio communication link with relevant diagrams and equations. **(08 Marks)**

b. Explain the concept of shielded strip line and co-planar strip line with neat diagram. **(04 Marks)**

c. A radio link has 15W transmitter connected to an antenna of 2.5m^2 effective aperture at 5GHz. The receiving antenna has an effective aperture of 0.5m^2 and located at 15km distance from the transmitting antenna. Assuming lossless matched antennas, find the power delivered to the receiver. **(08 Marks)**

OR

6 a. Define the following :
i) Radiation pattern ii) Radiation intensity iii) Gain iv) Effective Height. **(08 Marks)**

b. Write a short note on Antenna field zones. **(06 Marks)**

c. An antenna has a field pattern given by $E(\theta) = \cos^2\theta$ for $0 \le \theta \le \pi/2$. Find the Beam are and directivity. **(06 Marks)**

Module-4

7 a. Derive an expression and draw the field pattern for an array of two isotropic point sources With same amplitude and phase spaced $\lambda/2$ apart. **(08 Marks)**

b. Explain the power theorem and its applications to an isotropic source. **(06 Marks)**

c. A source has a radiation intensity power pattern given by $U = U_m \sin\theta$ for $0 \le \theta \le \pi$; $0 \le \phi \le 2\pi$. Find the total power and directivity. **(06 Marks)**

OR

8 a. Explain the principle of pattern multiplication with example. **(06 Marks)**

b. Derive the radiation resistance of $\lambda/2$ antennas. **(08 Marks)**

c. Explain the concept of thin array antenna. **(06 Marks)**

Module-5

9 a. Derive the Radiation Resistance of small loop antenna. **(10 Marks)**

b. Explain with a neat diagram about the Rectangular Horn Antenna. **(10 Marks)**

OR

10 a. Write short notes on :
i) Yogi-Uda array ii) Parabolic Reflector. **(10 Marks)**

b. Explain in detail about Log periodic antenna. **(05 Marks)**

c. Discuss on the practical design considerations of Helical Antenna. **(05 Marks)**

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