CBCS SCHEME

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18EC63

Sixth 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. With a neat diagram, explain construction and operation of reflex klystron. **(10 Marks)**

b. A line of $R_0 = 400\Omega$ is connected to a load of $200 + j300\Omega$ and is excited by a matched generator at 800MHz. Find the location and length of a single stub nearest to the load to produce an impedance match. **(10 Marks)**

OR

2 a. Derive transmission line equations in voltage and current forms. **(10 Marks)**

b. A telephone line has R = 6Ω/km L = 2.2mh/km C = 0.005μF/km and G = 0.05 μ mho/km. Determine z_0, α, β at 1 kHz. **(06 Marks)**

c. Define reflection coefficient and standing wave. **(04 Marks)**

Module-2

3 a. Explain the operation of a precision type variable attenuator with a neat sketch. **(10 Marks)**

b. Draw the diagram of magic tee and derive S-matrix of magic tee. **(10 Marks)**

OR

4 a. Draw the diagram of H-TEE and derive S-matrix for H-tee. **(08 Marks)**

b. A 20MN signal to fed into one of the collinear port 1 of a lossless H-plane T-junction. Calculate the power delivered through each port when other ports are terminated in matched load. **(04 Marks)**

c. For a two port network with mismatched load derive an expression for input reflection coefficient. **(08 Marks)**

Module-3

5 a. Define the following terms with respect to antenna:
- i) Beam area
- ii) Radiation intensity
- iii) Directivity
- iv) Beam efficiency
- v) Effective aperature. **(10 Marks)**

b. What are the losses in microstrip lines and briefly explain the same? **(10 Marks)**

OR

6 a. Obtain an expression for FRIS transmission formula used in radio communication link. **(08 Marks)**

b. A radio link has a 15W transmitter connected to an antenna of $2.5m^2$ effective aperature at 5GHz. The receiving antenna has an effective aperature of $0.5m^2$ and is located at a 15km line of sight distance from the transmitting antenna. Assuming lossless matched antennas find the power delivered to the receiver. **(06 Marks)**

c. A source has a radiation intensity pattern given by $U = U_m \sin\theta$. The radiation intensity 'U' has a value only in the upper hemisphere $(0 \leq \theta \leq x)$ and $(\theta \leq \phi \leq 2x)$. Find total power radiated by the source and directivity. **(06 Marks)**

Module-4

7 a. State and explain the power theorem. **(08 Marks)**

b. Derive an expression for total field in case of two isotropic point sources of same amplitude and phase. Plot the relative field pattern when these two isotropic sources are spaced $\lambda/2$ apart. **(12 Marks)**

OR

8 a. Derive an expression for total field for linear array of n isotropic point sources of equal amplitude and spacing. **(10 Marks)**

b. Derive the expression for the radiation resistance of short dipole. **(10 Marks)**

Module-5

9 a. Obtain the expression for radiation resistance of small loop antenna. **(10 Marks)**

b. With a neat diagram, explain the operation of log 'periodic antenna'. **(10 Marks)**

OR

10 a. Discuss the following antenna types:
i) Helical antenna
ii) Yagi uda antenna. **(10 Marks)**

b. Explain rectangular horn antenna with a neat diagram. **(10 Marks)**

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