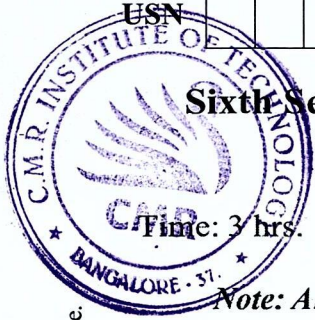


CBCS SCHEME

21EC62



Sixth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026

Microwave Theory and Antenna

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. List the characteristics of smith chart. (05 Marks)
- b. With neat diagram explain Gunn effect. (05 Marks)
- c. Starting from basics obtain the solution of transmission line-equation. (10 Marks)

OR

- 2 a. What is reflection coefficient? Obtain an expression for the same. How is it related to SWR? (08 Marks)
- b. A certain transmission line has the characteristic impedance of $75 + j0.01 \Omega$ and is terminated in a load impedance of $70 + j50 \Omega$
Compute:
 - i) The reflection coefficient
 - ii) The transmission coefficient
 - iii) Standing wave ratio (06 Marks)
- c. A transmission line has the following parameters $R = 2 \Omega$, $G = 0.5 \text{ mho/m}$, $f = 1 \text{ GHz}$, $L = 8 \text{ nH/m}$, $c = 0.23 \text{ pF}$.
Calculate :
 - i) Characteristic impedance
 - ii) Propagation constant
 - iii) Attenuation constant (06 Marks)

Module-2

- 3 a. State and prove following properties of s – parameters.
 - i) Symmetry property for reciprocal network.
 - ii) Unitary property for a loss less junction. (10 Marks)
- b. Derive the s – matrix representation for multiport network . Also define losses in terms of s – parameters. (10 Marks)

OR

- 4 a. Briefly explain Reciprocal phase shifter and non reciprocal phase shifters. (10 Marks)
- b. List characteristics of magic –T and also derive the expression of s – matrix for magic – T. (10 Marks)

Module-3

- 5 a. Define the following with relevant equations.
 i) Directivity (04 Marks)
 ii) Beam area (06 Marks)
- b. Derive Friss communication formula. (06 Marks)
- c. Determine directivity of the system if radiation intensity is given by
- $$U = U_m \sin^2 \theta \sin^3 \phi \quad 0 \leq \theta \leq \pi \quad 0 \leq \phi \leq \pi$$
- Using exact method and approximate method. (10 Marks)

OR

- 6 a. A certain microstrip line has following parameters.
 $\epsilon_r = 5.23$ $h = 7$ mils $t = 2.8$ mils and $w = 10$ mils
 Calculate characteristic impedance of the line. (06 Marks)
- b. Derive characteristic impedance of microstrip line. (08 Marks)
- c. Prove that directivity for a source with unidirectional pattern having radiation intensity
 $U = U_m \cos^n \theta$ $n \geq 1$ is expressed as $D = 2(n + 1)$ (06 Marks)

Module-4

- 7 a. Obtain field pattern for two point sources feed with equal amplitude and equal phase signal.
 Assume distance between two sources is $\lambda/2$. (10 Marks)
- b. Derive expression for radiation resistance of short dipole. (10 Marks)

OR

- 8 a. Briefly explain pattern multiplication. (05 Marks)
- b. Derive an array factor expression in case of linear array of 'n' isotropic point sources of equal amplitude and spacing. (10 Marks)
- c. Find directivity of unidirectional cosine pattern using exact method. (05 Marks)

Module-5

- 9 a. Derive expression for radiation resistance of loop antenna. (10 Marks)
- b. Derive for field equation for small loop antenna. (10 Marks)

OR

- 10 a. Explain Helix Modes. (06 Marks)
- b. Explain different types of horn antenna with schematic diagram. (08 Marks)
- c. Explain parabolic reflector. (06 Marks)

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