



CBCS SCHEME

7 E C O Y 8

17EC71

Seventh Semester B.E. Degree Examination, June/July 2023

Microwaves 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 the help of neat sketch, explain the construction and working of Reflex Klystron as oscillator. (12 Marks)
- b. Calculate maximum RF, repeller voltage for a beam current of 20 mA, if reflex Klystron is operated at 10 GHz with beam voltage of 300 V, repeller space of 0.1 cm for $1\frac{3}{4}$ mode. (08 Marks)

OR

- 2 a. A transmission line has the following parameters: $R = 2 \Omega/m$, $G = 0.5 \text{ mmho/m}$, $f = 1 \text{ GHz}$, $L = 8 \text{ nH/m}$, $C = 0.23 \text{ pF}$. Calculate:
(i) The characteristic impedance
(ii) The propagation constant. (10 Marks)
- b. Define Reflection Coefficient. Show that $\Gamma = \frac{Z_L - Z_0}{Z_L + Z_0}$. (10 Marks)

Module-2

- 3 a. Define 'S' parameter. Mention all the four properties of S parameter. (08 Marks)
- b. Show that $[S^*] = [S]^{-1}$. (12 Marks)

OR

- 4 a. Define Magic tee. With the help of neat diagram, explain properties of magic tee. (07 Marks)
- b. Derive 'S' matrix for the same. (10 Marks)
- c. Mention application of 'Magic-T'. (03 Marks)

Module-3

- 5 a. Derive an equation for characteristic impedance for narrow strip line. (10 Marks)
- b. Write short notes on parallel strip lines. Discuss its attenuation losses along with suitable equation. (10 Marks)

OR

- 6 a. Define the following with respect to Antenna:
(i) Radiation Pattern (ii) Beam Area (iii) Radiation Intensity
(iv) Directivity (D) (v) Beam efficiency (10 Marks)
- b. Prove that $D = \frac{4\pi}{\Omega_A}$. (06 Marks)
- c. Determine half power beam width, if an antenna has field pattern $E(\theta) = \cos^2 \theta$, $0 \leq \theta \leq 90^\circ$. (04 Marks)

Module-4

- 7 Obtain an expression for total electric field for 2 point sources supplied with current having equal magnitude and same phase. Also obtain (i) Array factor (ii) Directions of maxima (iii) Directions of minima. Consider distance between point sources as $d = \lambda/2$. (20 Marks)

OR

- 8 a. Prove that, Radiation Resistance of short electric dipole is $R_r = 80\pi^2 \left(\frac{L}{\lambda}\right)^2$. (12 Marks)
b. Write short notes on thin linear antenna. (08 Marks)

Module-5

- 9 a. Obtain Far field equation for a small loop antenna. (12 Marks)
b. Write short notes on types of horn antenna. (08 Marks)

OR

- 10 a. With the help of neat diagram, explain the construction and working of Yagi Uda antenna. (10 Marks)
b. A right handed monofilar helical antenna has 10 turns, 100 mm diameter, 70 mm turn spacing. Calculate and sketch far field pattern at 1 GHz and determine HPBW, BWFN, Gain and axial ratio. (10 Marks)
