CBCS SCHEME

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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 1¾ mode. **(08 Marks)**

OR

2 a. A transmission line has the following parameters: R = 2 Ω/m, G = 0.5 mmho/m, f = 1 GHz, L = 8 nH/m, C = 0.23 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 $[S^*] = [S]_t^{-1}$. **(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 $E(\theta) = \cos^2\theta, 0 \le \theta \le 90°$. **(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 monofillar 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)**

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