CBCS SCHEME

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17EC71

Seventh Semester B.E. Degree Examination, Feb./Mar. 2022
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 neat diagrams, explain the concept of reflex system. **(10 Marks)**

b. Calculate the transet time at the cavity gap, transit angle and velocity of electron leaving the gap for 2- cavity klystron that operates at 4GHz with a DC beam voltage of 5kV and 2mm cavity gap. **(06 Marks)**

c. Define VSWR. **(04 Marks)**

OR

2 a. Obtain the transmission line equations from fundamentals. **(10 Marks)**

b. A transmission line has a resistance of 2Ω/m with an inductance value of 8n H/m. The conductance of the line is 0.5m mho/m and capacitance is 0.23p.F. f = 1GHz. Find the characteristics impendence of the line and the propagation constant. **(04 Marks)**

c. What is a Smith chart? Explain the different measurement that can be determined using a smith chart? **(06 Marks)**

Module-2

3 a. Explain the properties of S parameters as applicable to a microwave network. **(10 Marks)**

b. Write short notes on :
   i) Coaxial connectors and adapters
   ii) Attenuators. **(10 Marks)**

OR

4 a. What is a Magic Tee? Explain its properties. Also determine its S-matrix. **(10 Marks)**

b. Explain a directional coupler and write its S-matrix. **(10 Marks)**

Module-3

5 a. A certain microstripline has the following parameters.
$\varepsilon_r = 5.23$ h = 7 mils t = 2.8 mils w = 10mils [Note : 1mil = 0.0254mm]. Calculate the characteristic impedance of line (Z_0). **(04 Marks)**

b. Explain a parallel strip line, with neat diagram and relevant equations. **(06 Marks)**

c. Define the following :
   i) Radiation Intensity
   ii) Aperture of Antenna
   iii) Beam area
   iv) Directivity
   v) Reduction pattern. **(10 Marks)**

OR

6 a. Derive Friis transmission formula. **(08 Marks)**

b. Compute the power received by an antenna in case of transmission over a distance of 150km at 500MHz. When gain G of antennas used are both 25dB. (P_T = 200W). **(06 Marks)**

c. Obtain a relationship between directivity and effective aperture. **(06 Marks)**

Module-4

7 a. Plot the field pattern for an array of 2 isotropic sources with equal amplitude and same phase. Take $d = \lambda/2$. **(07 Marks)**

b. Find Directivity of a source with a sine squared pattern (doughnut) (power pattern). **(07 Marks)**

c. State and explain power theorem. **(06 Marks)**

OR

8 a. Obtain the field pattern for a linear uniform array of isotropic antennas for $n = 6$, $d = \frac{\lambda}{2}$, $\partial = -d_r$ **(08 Marks)**

b. Obtain an expression for radiation resistance of a short dielectric dipole. **(06 Marks)**

c. Define and explain the principle of pattern multiplication. **(06 Marks)**

Module-5

9 a. From fundamentals obtain the radiation resistance of a small loop antenna. **(08 Marks)**

b. For a horn antenna, explain the horn antenna optimum dimensions. Explain with an example. **(06 Marks)**

c. Explain the principle of working of a parabolic Reflector antenna. **(06 Marks)**

OR

10 a. Define helix geometry. Explain the practical design considerations for the monoflex axial mode helical antenna. **(06 Marks)**

b. Explain the principle of a Yagi Uda Array Antenna. **(08 Marks)**

c. Calculate the directivity of a horn antenna with $a_e\lambda = 10\lambda$ $a_H = 9\lambda$ **(06 Marks)**

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