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17EC71

Seventh Semester B.E. Degree Examination, July/August 2021
Microwaves and Antennas

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

1 a. Describe the mechanism of oscillations in case of Reflex klystron. **(07 Marks)**

b. Give the solutions of Transmission line equations and find the expression for phase velocity. **(08 Marks)**

c. A transmission line has following parameters R = 2Ω/m, G = 0.5mmho/m, f = 1GHz, L = 8nH/m, C = 0.23PF.
Calculate:
i) Characteristic impedance
ii) Propagation Constant. **(05 Marks)**

2 a. Define reflection coefficient. Derive the equation for reflection coefficient at the load end at a dist "d" from the load. **(07 Marks)**

b. Describe the different mode curve in the case of reflex klystron. **(07 Marks)**

c. A transmission line has a characteristic impedance of 50 + j0.01Ω and is terminated in a load impedance of 73 – j42.5Ω. Calculate:
i) Reflection coefficient
ii) Standing wave ratio. **(06 Marks)**

3 a. State and explain the properties of s-parameters. **(07 Marks)**

b. Explain the working of precision type variable attenuator with a neat diagram. **(06 Marks)**

c. Two transmission lines of characteristic impedance Z_1 and Z_2 are joined at plane PP'. Express s-parameters in terms of impedances. **(07 Marks)**

4 a. Draw the diagrams of coaxial connectors and explain. **(07 Marks)**

b. Discuss E plane Tee. Derive its scattering matrix. **(06 Marks)**

c. A 20mW signal is fed into one of 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. **(07 Marks)**

5 a. Find the Quality factor Q_d of microstrip lines. **(07 Marks)**

b. Draw the diagram of parallel strip lines. Find the characteristic impedance of a lossless parallel strip lines. **(07 Marks)**

c. Define the following :
i) Antenna ii) Beam efficiency iii) Effective Aperture iv) Directivity. **(06 Marks)**

6 a. Explain the concept of shielded strip line and co-planar strip lines with diagrams. **(07 Marks)**

b. Define the following :
i) Radiation pattern
ii) Radiation Intensity
iii) Gain
iv) Effective Height. **(07 Marks)**

c. A radio link has a 15w transmitter connected to an antenna of $2.5m^2$ effective aperture at 5GHz. The receiving antenna has effective aperture 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)**

7 a. Explain power theorem and its application to an Isotropic source. **(07 Marks)**

b. Explain the principle of pattern multiplication. **(07 Marks)**

c. A source has a radiation intensity power pattern given by $U = U_m \sin^2\theta$ for $0 \le \theta \le \pi$; $0 \le \phi \le 2\pi$. Find the total power and directivity. Draw pattern. **(06 Marks)**

8 a. Derive the equation for radiation Intensity. Explain the concept of field patterns. **(07 Marks)**

b. Find the radiation resistance of a $\frac{\lambda}{2}$ Antenna. **(07 Marks)**

c. With diagram, explain the concept of Thin linear Antenna. **(06 Marks)**

9 a. Draw the diagram of a loop Antenna and explain. **(07 Marks)**

b. Find the radiation resistance of loops, as related of Antenna. **(07 Marks)**

c. Explain the working and design consideration of log periodic antenna. **(06 Marks)**

10 a. Explain the concept of Rectangular Horn Antenna. **(07 Marks)**

b. Write short notes on :
i) Yagi-uda Array ii) Parabolic reflector. **(07 Marks)**

c. A 16 turn helical beam Antenna has a circumference of λ and turn spacing of $\frac{\lambda}{4}$. Find
i) HPBW ii) Axial Ratio iii) Directivity. **(06 Marks)**

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