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

Time: 3 hrs

Max. Marks: 100

Note: Answer any FIVE full questions.

- 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  $R = 2\Omega/m$ ,  $G = 0.5\text{mmho/m}$ ,  $f = 1\text{GHz}$ ,  $L = 8\text{nH/m}$ ,  $C = 0.23\text{PF}$ .  
Calculate:  
i) 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  $50 + j0.01\Omega$  and is terminated in a load impedance of  $73 - j42.5\Omega$ . 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  $2.5\text{m}^2$  effective aperture at 5GHz. The receiving antenna has effective aperture of  $0.5\text{m}^2$  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  $0 \leq \theta \leq \pi$  ;  $0 \leq \phi \leq 2\pi$ . 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  $\lambda$  and turn spacing of  $\frac{\lambda}{4}$ . Find  
 i) HPBW      ii) Axial Ratio      iii) Directivity. (06 Marks)

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