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## Sixth Semester B.E. Degree Examination, Jan./Feb. 2023 Microwave and Antennas

Time: 3 hrs.

Max. Marks: 100

- Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. Use of Smith chart is permitted.

### Module-1

- 1 a. Describe the mechanism of oscillation of Reflex Klystron. (07 Marks)  
b. Explain different mode curve in the case of Reflex Klystron. (06 Marks)  
c. A reflex Klystron is to be operated at frequency of 10GHz, with DC beam voltage 300Volt repeller space 0.1cm for  $1\frac{3}{4}$  mode. Calculate  $P_{RF\ max}$  and corresponding repeller voltage for a beam current 20mA. (07 Marks)

OR

- 2 a. Explain with neat diagram of microwave system. (06 Marks)  
b. Derive transmission line equation in voltage and current forms. (07 Marks)  
c. Explain salient features of Smith chart. (07 Marks)

### Module-2

- 3 a. What is reciprocal network? For a reciprocal microwave N – port network prove that the Z and Y matrices are symmetrical. (07 Marks)  
b. Explain S – matrix representation of multiport network. (07 Marks)  
c. State and prove the following properties of S – parameters.  
i) Symmetry property for reciprocal network  
ii) Unitary property for a lossless junction. (06 Marks)

OR

- 4 a. Explain with a neat sketch a precision type variable attenuator. (07 Marks)  
b. Explain with diagram a phase shifter. (06 Marks)  
c. Explain magic tee and derive the S-matrix and mention its applications. (07 Marks)

### Module-3

- 5 a. Derive the characteristic impedance of micro-strip line. (07 Marks)  
b. Derive the characteristic impedance of shielded strip line. (07 Marks)  
c. A certain micro strip line has the following parameters :  
 $\epsilon_r = 5.23$  ;  $h = 7$  mils ;  $t = 2.8$  mils and  $w = 10$  mils.  
Calculate the characteristic impedance  $Z_0$  of the line. (06 Marks)

OR

- 6 a. Explain the basic Antenna parameters. (07 Marks)  
b. Explain briefly :  
i) Radiation intensity  
ii) Beam efficiency  
iii) Directivity and Gain. (07 Marks)  
c. Explain the radio communication link and derive Frii's transmission formula. (06 Marks)

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.

**Module-4**

- 7 a. Explain and derive the arrays of two isotropic point sources of same amplitude and phase. (10 Marks)  
b. Explain with neat diagram linear arrays of 'n' isotropic point sources of equal amplitude and spacing. (10 Marks)

OR

- 8 a. Explain the electric and magnetic fields of short dipole. (07 Marks)  
b. Explain the radiation resistance of short electric dipole. (07 Marks)  
c. Explain the linear antenna. Also write supporting equations for E and H field. (06 Marks)

**Module-5**

- 9 a. Explain with relevant equations the small loop antenna. (06 Marks)  
b. Explain the directivity of circular loop antenna with uniform current. (07 Marks)  
c. With supporting equations explain rectangular Horn Antenna. (07 Marks)

OR

- 10 a. Explain with neat diagram of Helix Geometry and Helix modes. (07 Marks)  
b. Explain practical design consideration for the mono-filar axial mode Helical antenna. (07 Marks)  
c. Explain briefly :  
i) Yagi – Uda array  
ii) Parabolic reflector. (06 Marks)

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