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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Sixth Semester, B.E. - Electronics and Communication Engineering

Semester End Examination; August - 2023

Microwaves and Antennas

Time: 3 hrs *Max. Marks: 100*

Course Outcomes

The Students will be able to:

CO1: Apply the knowledge of mathematics and EM fields to understand the parameters, field due to antennas, properties of microwave devices and transmission lines.

CO2:Analyse the working and performance of microwave transmission lines, microwave IC's and antennas Applying basic concepts of Microwave theory

CO3: Examine the working and performance of microwave sources, microwave transmission line and different types of antennas.

CO4: Analyse the working and performance of microwave devices and antenna arrays.

CO5: Design of helical, log-periodic and micro strip antennas

Note: ***I) PART-A*** *is compulsory.* ***Two*** *marks for each question.*

II) PART-B*: Answer any* ***Two*** *sub questions (from a, b, c) for Maximum of* ***18 marks*** *from each unit.*

Q. No.	Questions	Marks	BLs	COs	POs
	I : PART - A	**10**			
1 a.	A transmission line has series impedance of $Z = 0.8 + j75.4\ \Omega$ and shunt admittance of $Y = (0.8 + j3) \times 10^{-3}$ mho. Calculate; i) Propagation constant ii) Attenuation constant.	2	L3	CO2	PO2
b.	Write any two differences between tunnel diode and normal *P-n* junction diode.	2	L2	CO3	PO2
c.	A directional antenna has a maximum electrical dimension of 50 m and the wavelength is 3 m. A field is measured at 1 km from the antenna. Is it near or far field?	2	L3	CO3	PO2
d.	For two elements array write equation for total of the array and array factor.	2	L3	CO4	PO2
e.	Define normal mode and axial mode of operation of helical antenna.	2	L2	CO3	PO2
	II : PART - B	**90**			
	UNIT - I	**18**			
2 a.	Discuss the mismatch losses in transmission line along with related equations.	9	L3	CO3	PO2
b.	Explain the fabrication steps followed in thick film deposition method of MIC manufacturing.	9	L2	CO2	PO2
c.	A 50 Ω lossless line connects a matched signal of 100 kHz to a load of 100 Ω. The load power is 100 mW. Calculate the;	9	L4	CO2	PO2

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i) Voltage reflection coefficient of the load

ii) VSWR of the load

iii) Position of the first V_{min} and V_{max}

iv) Impedance at V_{min} and V_{max}

v) Values of V_{max} and V_{min}

	UNIT - II	**18**			
3 a.	Analyze the working of precision-type variable attenuator with related diagrams and write the equation for its attenuation factor.	9	L4	CO4	PO2
b.	Discuss the characteristics of Magic-T and derive its S-matrix.	9	L4	CO4	PO2
c.	Explain the transferred electron effect along with its V-I characteristics and also explain the TT mode and LSA mode of operation of Gunn Diode.	9	L3	CO3	PO2
	UNIT - III	**18**			
4 a.	Define a parameter directivity and radiation intensity of antenna is given by $B_0 \cos\theta$ w/m^2. Determine the total radiated power and maximum directivity of the antenna, if $0 \le \phi \le 2\pi$ and if $0 \le \theta \le \pi/2$.	9	L4	CO3	PO2
b.	Explain antenna efficiency, Beam efficiency and antenna radiation efficiency along with related equations.	9	L3	CO3	PO2
c.	Discuss the following terms with respect to antenna with related equation and diagram; i) Radiation pattern ii) HPBW and FNBW iii)Bandwidth	9	L4	CO3	PO2
	UNIT - IV	**18**			
5 a.	Derive the equation for power density and radiation resistance of infinitesimal dipole.	9	L4	CO3	PO2
b.	Derive the equation for directivity of N-element linear Broadside array.	9	L4	CO4	PO2
c.	Discuss the following field distribution due to infinitesimal dipole; i) Near-field region ii) Intermediate field region iii) Far-field region	9	L4	CO3	PO2
	UNIT - V	**18**			
6 a.	Discuss the design procedure of Helical antenna along with neat diagram and related equations.	9	L4	CO5	PO3
b.	Explain the working principle of following type of antenna: i) Log-periodic dipole array ii) Planar and Wire logarithmically periodic antenna	9	L4	CO5	PO3
c.	Design a rectangular micro strip antenna using a substrate with dielectric constant of 2.2, h = 0.1588 cm so as to resonate at 10 GHz.	9	L4	CO5	PO3

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