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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; July / Aug. - 2022

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**			
I a.	Define; (i) Reflection coefficient (ii) Transmission coefficient of a transmission line	2	L4	CO2	PO2
b.	Distinguish between E-plane Tee and H-plane Tee.	2	L4	CO3	PO2
c.	Define Half power beam width and beam Efficiency.	2	L3	CO1	PO1
d.	Write the directivity equation for broadside array and end fire array.	2	L4	CO4	PO2
e.	Mention the 4 feeding method of Microstrip patch antennas.	2	L4	CO5	PO3
	II : PART - B	**90**			
	UNIT - I	**18**			
1 a.	Explain the mismatch losses in transmission lines.	9	L4	CO2	PO2
b.	A 50 ohm lossless line connects a matched signal of 100 kHz to a load of 100 ohm. The load power in 100 mW. Calculate; (i) Voltage reflection coefficient of the load (ii) VSWR of the load (iii) Position of first V_{max} and V_{min} (iv) Impedance at V_{min} and V_{max} and values of V_{max} and V_{min}	9	L4	CO2	PO2
c.	Discuss the field equations for TE and TM waves in Rectangular waveguide.	9	L4	CO2	PO2
	UNIT - II	**18**			
2 a.	With a neat diagram, explain the working of an E-plane Tee junction, also derive its scattering matrix.	9	L4	CO3	PO2
b.	Discuss the construction and working of Precision rotary phase shifter with related equations and diagram.	9	L4	CO4	PO2

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c.	What is "Transferred electron effect" in Semiconductors? Explain the TT mode LSA mode of operation of Gunn diode.	9	L4	CO3	PO2
	UNIT - III	**18**			
3 a.	Discuss the following terms with respect to Antenna; (i) Radiation pattern Lobes (ii) Directivity and Gain (iii) Radiation Efficiency	9	L3	CO1	PO1
b.	A lossless resonant half wavelength dipole antenna with input impedance of 73 ohms, is to be connected to a transmission line whose characteristic impedance is 50 ohms. The pattern of antenna is $U = B_0 Sin^3 \theta$. Calculate the overall maximum gain of the antenna.	9	L2	CO4	PO2
c.	Analyze the radiation mechanism for the following: (i) Single-wire using electromagnetic radiation equation (ii) Two-wires and Dipole	9	L4	CO2	PO2
	UNIT - IV	**18**			
4 a.	Derive the equation for magnetic field Vector A and electric field components due to infinitesimal dipole antenna.	9	L4	CO3	PO2
b.	Derive an array factor and HPBW expression in case of linear array of 'n' isotropic point source of equal amplitude and spacing.	9	L4	CO4	PO2
c.	Derive an expression for Power density and radiation resistance of infinitesimal dipole.	9	L4	CO4	PO2
	UNIT - V	**18**			
5 a.	Analyze the following for rectangular microstrip patch antenna with related equation and diagrams; (i) Effective length and width (ii) Resonant frequency (iii) Design procedure	9	L4	CO5	PO3
b.	With a neat diagram, explain the working principle of Helical antenna along with the design procedure.	9	L4	CO5	PO3
c.	Discuss the design of dipole array with design equation and its design procedure.	9	L4	CO5	PO3

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