

BALLARI INSTITUTE OF TECHNOLOGY & MANAGEMENT

(Autonomous Institute under Visvesvaraya Technological University, Belagavi)

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Course Code

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Sixth Semester B.E. Degree Examinations, September/October 2024

MICROWAVES AND ANTENNAS

Duration: 3 hrs

Max. Marks: 100

Note: 1. Answer any FIVE full questions choosing ONE full Question from each Module.
2. Missing data, if any, may be suitably assumed

<u>Q.No</u>	<u>Question</u>	<u>Marks</u>	<u>(RBTL:CO: PI)</u>
<u>Module-1</u>			
1.	a. Explain the working of Reflex Klystron oscillator along with its oscillation mechanism.	08	(2 :1: 1.3.1)
	b. What is smith chart and list the characteristics of the smith chart.	06	(2 :1: 1.3.1)
	c. Define Standing Wave Ratio (SWR). Derive the relationship between VSWR and the reflection coefficient.	06	(3 :1: 1.3.1)
(OR)			
2.	a. Derive transmission line equations by the method of distributed circuit theory considering the elementary section of a transmission line.	08	(2 :1: 1.3.1)
	b. Explain the microwave system with the aid of a block diagram.	06	(2 :1: 1.3.1)
	c. The primary constants of a transmission line/m are specified as $R=2 \Omega$, $L=8 \text{ nH}$, $G=0.5 \text{ m}\Omega$, $C=0.23 \text{ pF}$, Calculate i) characteristics impedance (Z_0) ii) Propagation Constant (γ) if $f=1 \text{ GHz}$	06	(3 :1: 1.4.1)
<u>Module-2</u>			
3.	a. State and explain the properties of S-parameters as applicable to microwave networks.	10	(2 :2: 1.3.1)
	b. Derive the S-matrix representation of a multiport network. Also, define the various losses in terms of S-parameters	10	(2 :2: 1.4.1)
(OR)			
4.	a. Derive the S-matrix for magic tee by considering the characteristics (Properties) of the magic tee and also list the applications of magic tee.	10	(2 :2: 1.3.1)
	b. Illustrate the working of a precision rotary variable attenuator, with the help of a neat diagram and E-field components.	10	(2 :2: 1.3.1)
<u>Module-3</u>			
5.	a. Define the following: (i) Radiation intensity (ii) Aperture of the antenna (iii) Beam Area (iv) Gain (v) Radiation Pattern	10	(2 :3: 1.3.1)
	b. Derive the Friss transmission formula for the radio communication link.	06	(3 :3: 1.4.1)
	c. Define directivity. Obtain the relationship between directivity and beam area to show that smaller the beam area, larger is the directivity.	04	(3 :3: 1.3.1)
(OR)			

Note: (RBTL - Revised Bloom's Taxonomy Level: CO - Course Outcome: PI- Performance Indicator)

6.	a.	Derive the radiation resistance of a short dipole.	10	(3 :4: 1.4.1)
	b.	Show that the directivity of $\lambda/2$ dipole is 1.644.	06	(3 :4: 1.4.1)
	c.	Write a short note on folded dipole.	04	(2 :4: 1.3.1)
<u>Module-4</u>				
7.	a.	Derive array factor for uniformly excited equally spaced linear n element isotropic array with necessary illustrations.	08	(3 :4: 1.3.1)
	b.	Obtain the expression for the total field in the case of two isotropic point sources with the same amplitude and opposite phase. Plot the expected relative field pattern.	08	(2 :4: 1.3.1)
	c.	Calculate the exact directivity for the given unidirectional radiation intensity pattern: $U=U_m \sin^2\theta$ (Take: $0<\theta<90^\circ$ and $0<\phi<360^\circ$)	04	(3 :4: 2.1.2)
(OR)				
8.	a.	With a neat sketch explain different types of smart antennas.	10	(2 :4: 1.3.1)
	b.	State and explain the power theorem as applicable to an Isotropic source.	06	(2 :4: 1.3.1)
	c.	List the applications of smart antennas.	04	(1:4: 1.3.1)
<u>Module-5</u>				
9.	a.	Illustrate different feeding methods of micro-strip patch antennas with neat sketches.	10	(2:5:1.3.1)
	b.	Explain the design aspects of a rectangular micro-strip patch antenna with necessary sketches and equations.	06	(3:5:1.4.1)
	c.	List the advantages and applications of micro-strip antennas.	04	(1:5: 1.3.1)
(OR)				
10	a.	Describe a helical antenna with the help of a neat diagram. Explain its modes of operations with necessary illustrations.	10	(2:5:1.3.1)
	b.	Discuss the following:	10	(2:5:1.3.1)
		(i) Log periodic antenna (ii) Parabolic reflector antenna.		

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