U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

July 2024 Semester End Main Examinations

Programme: B.E. **Semester: V**
Branch: Electronics and Communication Engineering **Duration: 3 hrs.**
Course Code: 22EC5PCMTA **Max Marks: 100**
Course: Microwave Theory and Antenna

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

			CO	*PO*	Marks
		UNIT - I			
1	a)	A commercial coaxial cable has a characteristic impedance of 75Ω. This cable is integrated with a load of 50-j25 Ω. Determine the value of the input reflection coefficient of this line? Do pure standing waves exist on this line?	CO1	PO1	**04**
	b)	Derive the relationship between Voltage Standing wave ratio and input reflection coefficient. Consider a commercial WiFi antenna operating at 2.4GHz, this antenna has an input reflection coefficient of -15dB. Compute the corresponding VSWR. Is this a good antenna?	CO1	PO1	**10**
	c)	A transmission line has the following parameters: R = 2Ω/m G=0.5mmho/m, L=8nH/m and C=0.23pF/m. The aforementioned line is operating at 1GHz. Determine the characteristic impedance of the line and the propagation constant of this line.	CO1	PO1	**06**
		UNIT - II			
2	a)	With the neat sketch, explain the construction of an E-plane Tee junction Also, deduce the S-parameters for this junction.	CO1	PO1	**08**
	b)	Consider a H-plane metallic Tee-junction, compute the power delivered to the loads of 40 ohm and 60 ohm connected to arms 1 and 2, when 10mW power is injected to the matched port 3	CO1	PO1	**07**
	c)	A shunt impedance 'Z' is connected across a transmission line with characteristic impedance Z_0. Determine the S-matrix for this two-port network	CO2	PO1	**05**
		OR			
3	a)	A commercial 3-port circulator operating in the X-band has the following specifications at 10GHz. Insertion loss of 1dB, isolation between ports is 30dB and VSWR at all the ports is 1.5. Evaluate the S-matrix for this commercial circulator.	CO2	PO1	**08**
	b)	A magic-T with ports 1, 2 (collinear) and 4 (difference arm) is terminated by impedances which offer reflection coefficients Γ_1= 0.5, Γ_2 = 0.6 and Γ_4 = 0.8 respectively. If 1W power is fed at port	CO2	PO1	**12**

			3 (sum arm). Calculate the power reflected at port 3 and power transmitted to other ports.			
			UNIT - III			
	4	a)	Derive the expression for received power of a radio communication link. What is the maximum power received at a distance of 0.5 km over free space consisting of a transmitting antenna with 25dB gain and a receiving antenna of gain 20 dB. the transmitting antenna input is 150 watts. Operating frequency is 1GHz.	CO1	PO1	**08**
		b)	Define the following antenna parameters (i)Radiation Pattern (ii) Directivity & gain (iii) Radiation Intensity.	-	-	**04**
		c)	Derive the expression for effective height of an antenna in terms of radiation resistance and effective aperture.	CO1	PO1	**08**
			UNIT - IV			
	5	a)	Derive the expression for radiation resistance of short dipole antenna.	CO1	PO1	**10**
		b)	Analyze a suitable array system of two isotropic point sources in which the peak of the radiation pattern is parallel to the array axis.	CO2	PO2	**10**
			OR			
	6	a)	Derive the far-field radiation pattern of a linear array N isotropic point sources with equal amplitude and spacing.	CO1	PO2	**10**
		b)	An array of isotropic radiators is operated at a frequency of 6GHz and is required to produce a broadside array pattern. Determine first null beam width if array length is 10m and also the directivity.	CO2	PO2	**06**
		c)	State and explain principle of pattern multiplication.	CO1	PO1	**04**
			UNIT - V			
	7	a)	Derive the expression for the electric field distribution across the aperture of a parabolic reflector.	CO1	PO1	**08**
		b)	List the salient features of microstrip antennas.	-	-	**04**
		c)	Derive the expression for a far field patterns of thin linear antennas.	CO1	PO1	**08**

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