U.S.N.										

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

Autonomous Institute Affiliated to VTU

January / February 2025 Semester End Main Examinations

Programme: B.E. **Semester: : VII**

Branch: Electronics and Communication Engineering **Duration: 3 hrs.**

Course Code: 19EC7PCRFM **Max Marks: 100**

Course: RF & Microwave Engineering

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.

		UNIT - I	CO	PO	Marks
1	a)	Explain the RF circuit design considerations for High RF circuits	CO 1	---	5
	b)	Explain in brief reflection co-efficient, Transmission coefficient and Standing wave, w.r.t a transmission line. Obtain the relation between them	CO 1	PO 1	7
	c)	A Telephone line has the following parameters R=6 ohm/km G=0.05 u mho/km , f=1kHz , L=2.2 mH/km, C=0.005uF/km, calculate 1) Characteristic impedance Z_0. 2) The propagation constant r , α, and β if the length of the line is 100Km	CO 1	PO 1	8
		OR			
2	a)	Explain the effects of RF/MW signals in a circuit which are not present at DC or low AC	CO 1	---	5
	b)	Find the reflection co-efficient and VSWR for the following loads. 1)Z_L=0 , 2)$Z_{L=}\infty$, 3)$Z_{L=}Z_0$,4)Z_L=+jx 5)$Z_{L=}$ -jx	CO 1	PO 1	8
	c)	A 50ohm lossless line connects a matched signal of 100k Hz. to a load of 100 ohm. The load power is 100mW.Calculate the, **a.** Voltage reflection coefficient of the load, **b**. VSWR of the load, **c).** Position of the first Vmin and Vmax d).impedance at V_{min} and V_{max}.	CO 2	PO 2	7
		UNIT - II			
3	a)	Justify mathematically that the impedance and the admittance matrices are symmetrical for a reciprocal junction (network)	CO 1	PO 1	6
	b)	Develop the scattering matrix for a general two-port system. The derivation must include all the necessary equations and the generalized system.	CO 1	PO 1	6

		c)	S-parameters of a two-port network are given by $\mathbf{S} = \begin{bmatrix} 0.2\angle 0^0 & 0.6\angle 90^0 \\ 0.6\angle 90^0 & 0.1\angle 0^0 \end{bmatrix}$ Analyze to show that the network is Reciprocal but not Lossless. And also the Return loss at port1 when port 2 is short circuited.	***CO 2***	***PO 2***	**8**
			OR			
	4	a)	Justify the need of S-parameters in the analysis of microwave circuit and also define S-parameter.	***CO 1***	***PO 1***	**6**
		b)	Two transmission lines of characteristic impedance Z1 and Z2are joined at plane PP'. Express S-parameters in terms of impedances when each line is matched terminated.	***CO 2***	***PO 2***	**8**
		c)	Prove any three properties of Scattering -Matrix	***CO 2***	***PO 2***	**6**
			UNIT - III			
	5	a)	Derive the S-matrix for H-plane Tee	***CO 1***	***PO 1***	**6**
		b)	Define Coupling factor and Directivity of Directional coupler. Waveguide termination having VSWR Of 1.1 is used to dissipate 100 watts. Compute the reflected power	***CO 1***	***PO 1***	**6**
		c)	Analyze the construction and operation of a Magic-Tee with neat diagram and it's S-matrix.	***CO 2***	***PO 2***	**8**
			OR			
	6	a)	Explain the working principle of circulator. Prove that it is impossible to construct a perfectly matched lossless reciprocal three port junction.	***CO 1***	***PO 1***	**6**
		b)	Describe Faradays Rotation Isolator with figure. Write the S-matrix for lossless matched isolator	***CO 1***	***PO 1***	**6**
		c)	A matched isolator has insertion loss of 0.5dB and an isolation of 25 dB. Find the scattering coefficients. Write the s-matrix.	***CO 2***	***PO 2***	**8**
			UNIT - IV			
	7	a)	Explain the typical characteristics and applications of GUNN diode.	***CO 1***	***PO 1***	**5**
		b)	Explain the PIN diode With a neat sketch and the application of PIN diode as a Single switch.	***CO 1***	***PO 1***	**7**
		c)	Analyse working principle of operation of Avalanche transit time devices? Give the performance comparison of the three ATTDs	***CO 2***	***PO 2***	**8**
			OR			
	8	a)	Describe the constructional details and equivalent circuit of Gunn diode	***CO 1***	***PO 1***	**5**

		b)	Analyze the principle of operation of TRAPATT diode with a neat diagram and current-voltage waveform.	***CO 2***	***PO 2***	**7**
		c)	With a neat sketches ,explain the IMPATT diode operation.	***CO 1***	***PO 1***	**8**
			UNIT - V			
	9	a)	Explain the effects of Microwaves on Human body.	***CO 1***	***PO 1***	**5**
		b)	Explain electromagnetic compatibility and why it should be considered?	***CO 1***	***PO 1***	**5**
		c)	Describe the fabrication techniques and list the basic properties of the materials used for MMIC fabrication.	***CO 2***	***PO 2***	**10**
			OR			
	10	a)	List the advantage of RF MEM switches over solid state switches	***CO 1***	***PO 1***	**5**
		b)	Explain the Medical and Civil application s of Microwaves.	***CO 1***	***PO 1***	**5**
		c)	Describe any two applications of Microwave Imaging.	***CO 2***	***PO2***	**10**