U.S.N.										

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

Autonomous Institute Affiliated to VTU

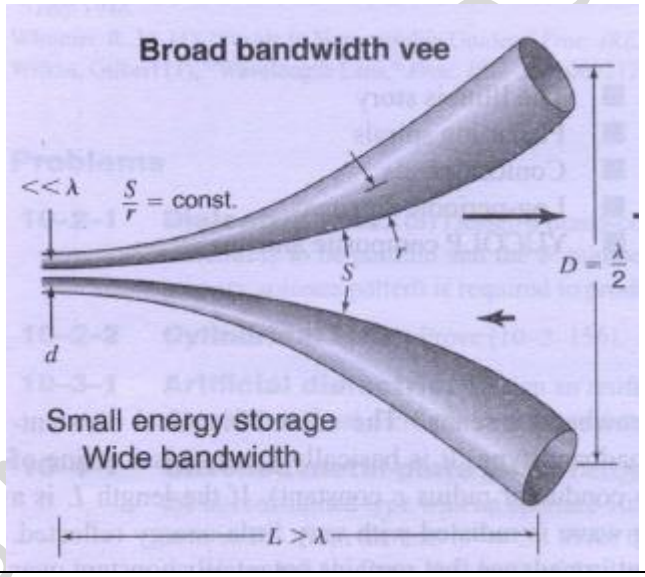
January / February 2025 Semester End Main Examinations

Programme: B.E. **Semester: VI**
Branch: Electronics & Telecommunication Engineering **Duration: 3 hrs.**
Course Code: 22ET6PCTLA **Max Marks: 100**
Course: Transmission Lines and Antennas

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

		UNIT - I	*CO*	*PO*	Marks
1	a)	Derive transmission line equations and its solution at microwave frequency	*CO2*	*PO1*	**06**
	b)	Derive an expression for the reflection and transmission coefficient in terms of characteristic impedance Z_0 and load impedance Z_L.	*CO1*	*PO1*	**06**
	c)	A parallel wire transmission line is having the following line parameters at 5kHz. Series resistance R=2.59×10^{-3}Ω/m, series inductance=2μH/m shunt conductance G=0ʊ/m and capacitance between conductors C=5.56nF/m. Find the characteristic impedance, attenuation constant, phase shift constant, velocity of propagation and wavelength.	*CO1*	*PO1*	**08**
		OR			
2	a)	What quantity is reflection factor used to measure? Derive an expression for reflection factor.	*CO2*	*PO1*	**06**
	b)	A lossless transmission line with Characteristic impedance of 60Ω is 400meters long. It is terminated with load Z_L = (40 + j80) Ω and operated at frequency 1MHz. The velocity of the wave is 2.4×10^8 m/sec. Find:(i) Reflection coefficient (ii) VSWR (iii) Input impedance	*CO2*	*PO1*	**08**
	c)	The characteristic impedance of a transmission line is 8039.5 Ω at a frequency of 8000 Hz. At this frequency the propagation constant was found to be 0.154∠90^0. Determine the value of line constant R, L, G and C.	*CO2*	*PO1*	**06**
		UNIT - II			
3	a)	Derive the expressions for parameters of open wire at high frequencies	*CO2*	*PO2*	**06**
	b)	A load impedance of Z=60-80j Ω is required to be matched to a 50 Ω coaxial line, by a short circuited stub of length 'l' located at	*CO2*	*PO2*	**08**

			a distance of 'd' from the load. The wavelength of operation is 1metre. Using Smith chart find 'd' and 'l'?			
		c)	Justify that a short-circuited line is a pure resistive quantity	*CO2*	*PO2*	**06**
			OR			
	4	a)	An-air filled dissipationless co-axial line having a characteristic impedance of 525Ω is terminated in an unknown load impedance Z_R.The first voltage minima and maxima were observed to be 24cm and 50cm respectively,from the load end.If the VSWR was 2.5 find wavelength and frequency of the travelling wave,Phase and magnitude of reflection co-efficient and terminated load impedance.	*CO2*	*PO2*	**07**
		b)	A loss-less transmission line with Z0=60Ω is 400m long.It is terminated with a load Z_R=(40+j80)Ω and operated at a frequency of 1MHz.The velocity of the wave on the line is 0.8 times the velocity of light.Using Smith chart,find the reflection coefficient,SWR and input impedance.	*CO2*	*PO2*	**10**
		c)	Using Smith chart,convert the following normalized impedances into normalized admittances. i)0.3+j0.4, (ii)1.2-j0.6 and (iii) 2+j0.5	*CO2*	*PO2*	**03**
			UNIT - III			
	5	a)	Prove that directivity for a source with unidirectional pattern of $U=U_m\cos^n\theta$, where ' n' can be any number, can be expressed as D= 2(n+1).	*CO3*	*PO3*	**06**
		b)	Obtain an expression and draw the field pattern for an array of 2 isotropic sources with same amplitude and opposite phase spaced λ/2 apart.	*CO3*	*PO3*	**06**
		c)	Develop Friis Transmission formula for radio communication link. An antenna has field pattern given by $U=U_m\sin\theta\sin3\Phi$ for $0 \le \theta \le \pi$, $0 \le \Phi \le \pi$. Find the beam area and directivity	*CO3*	*PO3*	**08**
			OR			
	6	a)	Derive the expression to show the relation between the directivity and effective aperture. Hence obtain the effective aperture of an isotropic antenna.	*CO2*	*PO1*	**06**
		b)	Obtain the far field pattern of linear uniform array of isotropic sources with following requirements. N=4, d= λ/2, δ= - dr . Also find HPBW and FNBW	*CO3*	*PO3*	**06**
		c)	Explain radiation intensity and beam efficiency. An antenna has field pattern given by $P=P_m\sin2\theta\sin3\Phi$ for $0 \le \theta \le \pi$, $0 \le \Phi \le \pi$. Find the beam area and directivity.	*CO3*	*PO3*	**08**
			UNIT - IV			
	7	a)	Obtain the expression for radiation resistance of Short dipole	*CO3*	*PO3*	**06**
		b)	Obtain the expression for radiation resistance of loop antenna	*CO3*	*PO3*	**06**
		c)	A half-wave dipole working at 100 MHz in free space radiates a power of 1000 Watts. Find the field strength at a distance of 10km in the direction of maximum radiation	*CO2*	*PO1*	**08**

			OR			
	8	a)	Obtain the expression for instantaneous electric field at a large distance 'r' from a loop antenna of radius 'a'.	*CO2*	*PO1*	**06**
		b)	An omni directional antenna has a field pattern given by E=10I/r(V/m) where I is the terminal current(A) and r is the distance(m0.Find the radiation resistance.	*CO2*	*PO1*	**06**
		c)	A dipole antenna of length 5cm is operated at a frequency of 100MHz with terminal current I_0=120mA.At time t=1sec,angle$\theta=45^0$ and distance=3m,find H_ϕ, E_r and E_θ	*CO3*	*PO3*	**08**
			UNIT - V			
	9	a)	Explain Infinite and finite biconical antennas,	*CO3*	*PO3*	**08**
		b)	Explain Rumsey's Principle the frequency-independent Planar log spiral antenna,	*CO3*	*PO3*	**06**
		c)	Analyze the working of log periodic antenna with relevant equations.	*CO3*	*PO3*	**06**
			OR			
	10	a)	Write an explanatory note on (i) Log periodic antenna and (ii) log spiral antenna	*CO2*	*PO1*	**10**
		b)	Write a note on disk cones and bow ties.	*CO2*	*PO1*	**06**
		c)	What is the bandwidth if d=4mm and D=100mm in the below given figure. 	*CO3*	*PO3*	**04**

******