21EC62

MODEL QUESTION PAPER 1

MICROWAVE and ANTENNAS

TIME: 03 Hours **Max. Marks: 100**

Note: 01. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.

		Module – 1	**Blooms Level**	**Marks**
Q.1	a.	Explain the bulk Transferred Electron effect in a semiconductor material .	L2	06
	b.	With neat block diagram explain the typical Microwave system	L3	04
	c.	Assume the wave equation and its solution , derive the expression for voltage and current at any point on the transmission line.	L3	10
		OR		
Q.2	a.	A transmission line has the following parameters R=1.2Ω/m, G=28μmho/m f=1GHz, L=18 nH/m, C=0.06pF. Calculate a)the characteristic impedance b) the attenuation constant c) phase constant d) wavelength e) velocity of wave propagation.	L3	08
	b.	List the characteristics of smith chart.	L2	04
	c.	With the help of a functional block diagram explain construction and modes of working of a GUNN Diode.	L3	08
		Module – 2		
Q.3	a.	Prove that impedance and admittance matrices are symmetrical for a reciprocal junction.	L3	06
	b.	Explain different types of Attenuators.	L2	06
	c.	Derive the S- matrix relation for E-plane.	L3	08
		OR		
Q.4	a.	List the characteristics of magic-T when all the ports are terminated with matched load. Also derive the expression of S matrix for magic T.	L2	06
	b.	Explain with a neat sketch construction and working of a four port Circulator.	L3	08
	c.	Write the S-Matrix representation for multiport network	L3	06
		Module – 3		
Q.5	a.	A lossless parallel strip line has a conducting strip width w. The substrate dielectric separating the two conducting strips has a relative dielectric constant ε_{rd} of 6 and thickness d of 4mm. Calculate i) width w of the conducting strip in order to have a characteristic impedance of 50 Ω. ii) The strip line capacitance iii)Strip line inductance iv)Phase velocity.	L3	08

	b.	Define the following terms as related to antenna system i)Directivity ii)beam area iii)Radiation pattern iv)Beam solid	L2	08
	c.	Determine the directivity of the system if the radiation intensity is$U=U_m \cos^3 \theta$	L3	04
		OR		
Q.6	a.	Discuss briefly micro strip lines and its losses and also derive the expression for quality factor.	L3	08
	b.	A radio link has a 15w transmitter connected to an antenna of $2.5m^2$ effective aperture at 5Ghz. The receiving antenna has an effective aperture of $0.5m^2$ and is located at 15km line of sight distance from the transmitting antenna. Assume lossless antennas. Find the power delivered to the receiver.	L3	05
	c.	Calculate the directivity of the source with the pattern $U=U_m \sin\theta \sin^3\phi$ using i)Exact Method ii) Approximate method . $0 \leq \theta \leq \Pi$ and $0 \leq \phi \leq \Pi$ and zero elsewhere.	L3	07
		Module – 4		
Q.7	a.	State and explain power theorem and its application to an isotropic source	L2	06
	b.	Obtain the field pattern for two point source situated symmetrically with respect to the origin .Two sources are feed with equal amplitude and equal phase signals, Assume distance between two sources=$\lambda/2$	L3	08
	c.	Distinguish between end fire array and broad side array.	L2	06
		OR		
Q.8	a.	Derive an array factor expression in case of linear array of n isotropic point sources of equal amplitude and spacing.	L3	08
	b.	Derive the expression for radiation resistance of short dipole with uniform current	L3	06
	c.	Starting from electric and magnetic potential , obtain the far filed components for a short dipole	L3	06
		Module – 5		
Q.9	a.	Derive the far field expression for small loop antenna.	L3	06
	b.	Explain the constructional details of Yagi-Uda antenna	L3	06
	c.	Find the length L, H-plane aperture and flare angle θE and θH of Pyramidal Horn for which E-plane aperture is 10λ Horn is fed by a rectangular waveguide with TE10 mode. Assume $\delta=0.2\lambda$ in E-Plane and 0.375λ in H-Plane. Also find E-Plane, H-Plane beam widths and directivity	L3	08
		OR		
Q.10	a.	Derive the radiation resistance of loop antenna and generalize the result for circular loop of any radius	L3	08
	b.	Briefly explain Helical Antenna with its helical Geometry.	L2	06
	c.	Explain different types of Horn Antennas. Explain different types of Horn Antennas.	L2	06

MODEL QUESTION PAPER 2

MICROWAVE and ANTENNAS

TIME: 03 Hours **Max. Marks: 100**

Note: 01. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.

		Module – 1	Blooms Level	Marks
Q.1	a.	What is 'Gunn effect'? with a neat diagram explain the constructional details of Gunn diode.	L2	07
	b.	Derive equations for voltage and current for a Transmission line.	L3	07
	c.	Determine the input impedence of a 200Ω line (3/8) wavelength long terminated in a 100Ω resistor. Using smith chart find the reflection coefficient.	L3	06
		OR		
Q.2	a.	Define reflection Coefficient. Derive the equations for the reflection coefficients at the load end and at a distance'd' from the load end.	L3	07
	b.	A microwave generator at 1.2G Hz supplies power to a microwave transmission line having the following parameters. R=0.8Ω/m, G=0.8mʊ/m, L=0.01μH/m , C=0.4pF/m. Calculate (a).Propagation constant (b) attenuation constant (c) Phase constant (d) Characteristic impedance.	L2	07
	c.	Discuss the characteristics of magic tee.	L3	06
		Module – 2		
Q.3	a.	Derive the S matrix representation of a multiport network.	L3	08
	b.	Explain Symmetrical Z and Y matrix for reciprocal network.	L2	08
	c.	Discuss the properties of S -matrix.	L3	04
		OR		
Q.4	a.	What are attenuators? Explain the principle and working of precision time variable attenuator.	L2	08
	b.	with neat diagram explain the construction , working and applications of isolator.	L3	08
	c.	What are Coupling and isolation factors in a micro strip directional coupler.	L3	04
		Module – 3		
Q.5	a.	Describe ohmic skin losses and radiation losses in micro strip lines.	L3	08
	b.	Derive characteristic impedance of micro strip lines.	L3	08
	c.	A gold parallel strip line of width 20mm contains polyethylene dielectric material between the strip lines having a dielectric constant of 2.25 and thickness of dielectric as 4mm. Determine the characteristic impedance and the phase velocity of propagating microwave.	L3	04

		OR		
Q.6	a.	Define the following terms with respect to antenna: (i) Beam area (ii) Radiation intensity (iii) Beam efficiency (iv) Directivity.	L2	08
	b.	Calculate the maximum power received at a distance of 0.5Km over a free space 1GHz. Circuit consisting of transmitting antenna with 25dB gain and a receiving antenna gain of 20dB.Assume the transmitting antenna input is 150W.	L3	08
	c.	Obtain the near and far fields of a given antenna and compare the fields.	L3	04
		Module – 4		
Q.7	a.	State and explain power theorem.	L2	07
	b.	Obtain field expression of two isotropic point sources of same amplitude and phase.	L3	07
	c.	Prove that directivity for a source with unidirectional pattern of Um Cos^n ɵ, Where 'n' can be any number, can be expressed as D = 2(n+1).	L2	06
		OR		
Q.8	a.	Derive an expression for radiation resistance of short electric dipole.	L3	07
	b.	Derive an array factor expression in case of linear array of 'n' isotropic point sources of equal amplitude and spacing.	L3	07
	c.	Derive the expression to calculate the bandwidth of a given antenna.	L3	06
		Module – 5		
Q.9	a.	Derive the far field expression for small loop antenna.	L3	08
	b.	Explain the constructional details for the following antenna. (i) Horn antenna (ii) Parabolic reflector	L3	08
	c.	What is the approximate directivity of a rectangular Horn antenna , whose physical aperture is $81\lambda^2$?	L3	04
		OR		
Q.10	a.	Derive the expression for radiation resistance of loop antenna	L3	08
	b.	Write short note on Helical antenna geometry.	L2	07
	c.	Calculate the aperture of a dipole antenna.	L2	05