GURU NANAK INSTITUTE OF TECHNOLOGY
An Autonomous Institute under MAKAUT
2022
ANTENNA AND WAVE PROPAGATION
EC404

TIME ALLOTTED: 3 HOURS **FULL MARKS: 70**

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable

GROUP – A
(Multiple Choice Type Questions)

Answer any ***ten*** from the following, choosing the correct alternative of each question: **10×1=10**

			Marks	CO No
1.	(i)	Displacement current density is a) D b) J c) $\partial \mathbf{D}/\partial t$ d) $\partial \mathbf{J}/\partial t$	1	CO4
	(ii)	The rate of energy flow is given by a) Maxwell equation b) Poynting vector c) Poisson equation d) Equation of continuity	1	CO2
	(iii)	In a non-isotropic directional antenna, which radiating lobe axis makes an angle of 180° w.r.t. major beam of an antenna? a) Major lobe b) Side lobe c) Back lobe d) None of the these	1	CO2
	(iv)	The range of the standing wave ratio is a) $0 < S < 1$ b) $-1 < S < 1$ c) $1 < S < \infty$ d) $0 < S < \infty$	1	CO1
	(v)	The resistive impedance of a half-wave dipole antenna is a) 0 ohm b) 377 ohm c) 50 ohm d) 73 ohm	1	CO3
	(vi)	Given that the reflection coefficient is 0.6. Find the SWR. a) 2 b) 4 c) 6 d) 8	1	CO2

	(vii)	Yag-Uda antenna is one kind of a) array b) reflector c) dipole d) none of these.	1	CO3
	(viii)	Intrinsic impedance in free space is a) 0 ohm b) 370 ohm c) 377 ohm d) none of these	1	CO2
	(ix)	Directivity of half wave dipole antenna is a) 0 b) 1.64 c) 10.2 d) -3.0	1	CO4
	(x)	The permeability of free space is a) zero H/m b) ∞ c) $4\pi \times 10^{-7}$ H/m d) 8.75×10^{12} H/m	1	CO2
	(xi)	What is the phase variation range for reflection coefficient in the transmission lines? a) 0° to 90° b) 90° to 150° c) 0° to 180° d) 90° to 360°	1	CO1
	(xii)	Distortion less condition for a transmission line is a) LG = RC b) LR = GC c) GR = LC d) LC=Q	1	CO2

GROUP – B

(Short Answer Type Questions)

Answer any ***three*** from the following: **3×5=15**

			Marks	**CO No**
2.	(a)	A loss less transmission line of length 100 m has an inductance of 28 μH and a capacitance of 20 μF and excited at100 KHz. Find i. Propagation velocity ii. Phase constant	5	CO1
3.	(a)	Find the expression of pointing vector. What is the physical interpretation of this vector?	5	CO1
4.	(a)	What is Hertzian dipole?	1	CO3
	(b)	Find the directive gain and the directivity of a Hertzian dipole.	4	CO3
5.	(a)	Express the Maxwell's equations and give interpretation	4	CO1
	(b)	What is the relation between decibel and neper ?	1	CO2
6.	(a)	State and explain boundary conditions at the interface of two media.	5	CO1

GROUP – C
(Long Answer Type Questions)
Answer any ***three*** from the following: **3×15=45**

			Marks	CO No.
7.	(a)	What is the meaning of antenna pattern and radiation intensity?	4	CO2
	(b)	Define: (i) Beamwidth (ii) Radiation resistance (iii) Gain of an antenna.	6	CO2
	(c)	What can be the minimum value of directivity?	1	CO2
	(d)	What is meant by Isotropic radiator?	1	CO2
	(e)	Explain the basic geometry and elements of Yagi-Uda antenna	3	CO3
8.	(a)	If a transmission line with $Z_0 = 75\ \Omega$ is connected to the antenna, determine the standing wave ratio.	3	CO1
	(b)	At a frequency of 80 MHz, a lossless transmission line has a characteristic impedance of 300Ω and a wavelength of 2·5 m. Find the value of L and C.	6	CO1
	(c)	Deduce the Friis Transmission formula.	3	CO2
	(d)	What is lossless line? What is the characteristic impedance of such line?	3	CO1
9.	(a)	What is Transmission Line? Derive the expression for voltage signal in Transmission line.	6	CO1
	(b)	A distortion-less line operating at 500 MHz has $Z_0 = 80\ \Omega$, $\alpha = 0.04$ Np/m, $\beta = 1.5$ rad/m. Find the line parameters R,L,G and C.	4	CO1
	(c)	What is the value of input impedance of a s transmission line if the line is connected to load $Z_L=0$, $Z_L=\infty$, $Z_L= Z_0$ (Consider load impedance Z_L, characteristic impedance Z_0)?	5	CO1
10.	(a)	A telephone line of length 100 km, has R=6 ohms/km, L=2.2 mH/km, C=0.005 mF/km, and G=0.05 mho/km. Determine Z_0, α, β, phase velocity at 1kHz.	10	CO1
	(b)	Derive the boundary conditions for Electric field crossing over from one dielectric to another dielectric medium.	5	CO1
11.		Answer any three	3x5=15	
	(a)	Smith chart	5	CO1
	(b)	Diffraction of Electromagnetic waves	5	CO4
	(c)	Near and far field of an antenna	5	CO2
	(d)	Ionosphere reflection	5	CO4
	(e)	Hertzian dipole	5	CO3