

K. J. Somaiya Institute of Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)

April – May 2023

(B. Tech) Program: B. Tech. (Electronics and Telecommunication) Scheme: II

Examination: TY Semester: VI

Course Code: EXC601 and Course Name: Electromagnetic and Antenna

Date of Exam: 12.05.2023

Duration: 2.5 Hours

Max. Marks: 60

Instructions:

- (1). All questions are compulsory.
- (2). Draw neat diagrams wherever applicable.
- (3). Assume suitable data, if necessary.

		Max. Marks	CO	BT level
Q 1	Solve any six questions out of eight:	12		
i)	Explain important features of loop antenna. Discuss use of loop antenna in radio direction finding.	2	5	U
ii)	Explain terms Beam width and Bandwidth of an antenna.	2	5	U
iii)	Write a short note on Faradays Law and poynting theorem.	2	2	U
iv)	What is Antenna Array. List five controls of array antenna. Differentiate between broadside and end fire array.	2	6	U
v)	Why smith chart matching techniques are preferable over conventional methods for impedance matching?	2	3	U
vi)	Explain Polarization of antenna and its type.	2	5	U
vii)	Differentiate between E layer and Sporadic E layer.	2	4	U
viii)	Explain Gauss Law and mention its applications.	2	1	U
Q.2	Solve any four questions out of six.	16		
i)	Derive expressions of radiation resistance of infinitesimal dipole antenna.	4	5	C
ii)	Derive an expression for the Maximum Usable Frequency (MUF) in terms of the skip distance and virtual height.	4	4	C
iii)	State Maxwell's equation for time varying fields in point and integral form.	4	2	U
iv)	Write a short notes on Reflector Antenna.	4	6	U

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V)	Explain the concept of potential gradient and the relation between electric field and potential.	4	1	U
vi)	A 50Ω loss less transmission line is connected to a load of $50+j50 \Omega$. The maximum voltage measured on the line is 50 v. Find the power delivered to the load and the peak voltage at the other load end of the line.	4	4	Ap
Q.3	Solve any two questions out of three.	16		
i)	A cube is defined by $1 \leq x \leq 1.2$, $1 \leq y \leq 1.2$, $1 \leq z \leq 1.2$ if $D = 2x^2y a_x + 3x^2y^2 a_y$ C/m ² (a) Apply Gauss's law to find the total flux leaving the closed surface of the cube. (b) Evaluate the $\nabla \cdot D$ at the center of the cube.	8	1	
ii)	Derive Friss transmission formula. State its significance in wireless communication.	8	4	Ap
iii)	With the help of a neat diagram explain the working of log periodic antenna. Justify why they also called frequency independent antennas? A log periodic dipole array is to be designed to cover the frequency range 54-216 MHz and have a gain 8.5 dB. ($\tau = 0.822$ and $\sigma = 0.149$)	8	5	Ap
Q.4	Solve any two questions out of three.	16		
i)	Explain microstrip patch antenna also discuss feeding mechanism of microstrip antennas. Design a rectangular microstrip antenna at 2.4 GHz on a substrate with dielectric constant 4.4 and substrate thickness 1.6 mm.	8	6	Ap
ii)	State Poynting theorem. Derive mathematical expression for Poynting theorem and explain the meaning of each term.	8	2	Ap
iii)	The transmission line is connected to a transmission line load impedance $50+j25$ at 300 MHz. Find the reflection coefficient and return loss at the load end. Impedance and VSWR at a distance of 20 cm from the load.	8	3	Ap
