

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: I

Examination: TY Semester: VI

Course Code: 1UEXC601 and Course Name: Electromagnetics and Antenna

Date of Exam: 25.05.2023 Duration: 03 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)	Define: Radiation resistance and antenna efficiency.	2	5	U
ii)	Describe ground wave propagation w.r.t leaky capacitor concept. Justify why vertically polarized antenna is suitable for his type of propagation?	2	4	U
iii)	List the application of Horn antenna.	2	6	U
iv)	Explain the concept of pattern multiplication. Compare broadside and End fire array.	2	6	U
v)	Compute the gain of an antenna in dB, if an antenna has a directivity of 20 and the radiation efficiency of 90%.	2	5	Ap
vi)	Why does a transmission line not radiate and antenna radiates?	2	3	U
vii)	Summarizes the boundary conditions for source free dielectric – dielectric interface and dielectric – conductor interface.	2	2	U
viii)	Define: Columbus law and Ampere circuit law.	2	1	U
Q.2	Solve any four questions out of six.	16		
i)	Explain boundary conditions of E and H fields for two media.	4	2	U
ii)	Explain the formation of inversion layer in troposphere.	4	4	U
iii)	Define the depth of penetration (skin depth). Determine it for Aluminum at 1 MHz (Assume $\mu_r=1$ and conductivity for Aluminum = $\sigma = 3.5 \times 10^7$ S/m)	4	1	Ap
iv)	A 50Ω loss less transmission line is terminated by a load impedance $Z_L = 50 - j75 \Omega$. If the incidence power is 100 mW, find the power dissipated by the load.	4	3	Ap

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v)	Compare Yagi- Uda antenna w.r.t. Log Periodic antenna.	4	5	U
vi)	What are the feed mechanism of parabolic reflector antenna and its different feeding method., explain anyone?	4	6	U
Q.3	Solve any two questions out of three.	16		
i)	The two charges $3 \mu\text{C}$ and $5 \mu\text{C}$ are separated by 8 cm. Find the force between them. If two charges are brought in contact and then separated by 5 cm. Find the force in this case.	8	1	Ar
ii)	Derive the expression for range of line of sight for space wave propagation in terms of antennas receiving and receiving heights. What is line of sight propagation?	8	4	Ap
iii)	Derive an expression for array factor of N element linear array, where all elements are equally fed and spaced. Also find the expression for the position of principle maxima, null and secondary maxima.	8	6	Ap
Q.4	Solve any two questions out of three.	16		
i)	State Poynting theorem. Derive mathematical expression for Poynting theorem and explain the meaning of each term.	8	1	U
ii)	The transmission line is connected to a transmission line load impedance $10+j20$ at 2 GHz. Find the reflection coefficient (i) at the load end of the line (ii) at a distance of 20 cm from the load.	8	3	Ap
iii)	Design circular microstrip antenna (CMSA) for 10 GHz operating frequency using substrate $\epsilon_r = 2.2$ with thickness of 1.588 mm.	8	6	Ap
