

17/5/22

K. J. Somaiya Institute of Engineering and Information Technology, Sion, Mumbai-22

(Autonomous College Affiliated to University of Mumbai)

End Semester Exam

April - May 2022

Program: B. Tech (EXTC)

Examination: LY Semester: VI

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

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)	Explain Gauss Law.	2	CO1	U
ii)	Explain Faraday's Law.	2	CO2	U
iii)	Explain SWR.	2	CO3	U
iv)	Derive the transmission line impedance equation.	2	CO3	U
v)	Explain FRIIS transformation	2	CO4	U

vi)	Explain sky wave propagation.	2	CO4	U
vii)	Define: Radiation Resistance and radiation pattern.	2	CO5	U
viii)	Why is microstrip antenna also called as patch antenna.	2	CO6	U
Q.2	Solve any four questions out of six.	16		
i)	A dipole having a moment $p=10ax-3ay+5az$ nC.m is located at Q(2,4,1) in free space. (a)Find V at P(x, y,z) (b) Find V at P (5,1,0).	4	CO1	Ap
ii)	Explain boundary conditions of E and H fields for two media.	4	CO2	U
iii)	Derive radiation resistance of small dipole. Explain its significance	4	CO5	An
iv)	Let the characteristic impedance of line be 50Ω , the line is terminated at following points $Z_1 = 100 + j50 \Omega$; $Z_2 = 100 - j50 \Omega$; $Z_3 = 100 \Omega$; $Z_5 =$ Open Circuit; $Z_6 =$ Short Circuit . Determine normalized impedance and locate on smith chart.	4	CO3	Ap
v)	Explain Ground wave propagation in detail.	4	CO4	U
vi)	Derive the array factor of a N-element uniform linear array and hence the condition for which the array will radiate broad side and end fire direction	4	CO6	U
Q.3	Solve any two questions out of three.	16		
i)	A charge $Q_0 = 1\mu C$ is located in free space at P(a,0,0). Prepare a sketch of magnitude of force on Q_0 as a function of a. $0 \leq a < 5m$, produced by two other charges, $Q_1 = 1C$ at (0,1,0) and $Q_2 =$: (a) 1C at (0,-1,0); (b) -1C at (0,-1,0).	8	CO1	Ap
ii)	Describe the difference between sky wave and space wave propagation.	8	CO4	U

iii)	Design a four-element ordinary end -fire with the element placed along the z-axis a distance d apart and with the maximum of the array factor directed toward $\theta = 0^\circ$. For a spacing of $d=\lambda/2$ between the elements find the (a) Progressive phase excitation between the elements to accomplish this (b) Angles (in degree) where the nulls of the array factor occur (c) Angles (in degree) where the maximum of the array factor occur (d) Beam width (in degree) between the first nulls of the array factor Directivity (in dB).	8	CO5	Ap
Q.4	Solve any two questions out of three.	16		
i)	State the pointing theorem and explain the meaning of each term.	8	CO2	U
ii)	The input impedance of a lossless airline operating at 500MHz is $(0.8-j1.25) Z_0$. Use smith chart to find(a) s , (b) Z_l/Z_0 if the load is located at the voltage minimum nearest to the input.	8	CO3	Ap
iii)	Design rectangular microstrip antenna for 2.4 GHz frequency applications using rogers RT/ Duroid 5880 substrate of thickness of 1.6 mm.	8	CO6	Ap