

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

*July - August* ~~May - June~~ 2024-25

B. Tech. Program: **Electronics and Telecommunication Engg. Scheme: IIB**  
~~Regular~~ **Supplementary** Examination: **TY Semester VI**  
 Course Code: **EXC601** and Course Name: **Electromagnetics and Antenna**  
 Date of Exam: ~~05-08-25~~ **05-08-26** 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.				
Q. No.	Question	Max. Marks	CO	BT level
<b>Q 1</b>	<b>Solve any two questions out of three: (05 marks each)</b>	<b>10</b>		
a)	Calculate E at P(1,1,1) caused by four identical 3 nC charges located at P <sub>1</sub> (1,1,0), P <sub>2</sub> (-1,1,0), P <sub>3</sub> (-1,-1,0) and P <sub>4</sub> (1,-1,0).		1	Ap
b)	State and prove the four boundary conditions.		2	E
c)	Calculate the reflection coefficient and VSWR for the given impedance using smith chart and verify the same using equations. Given: $Z_L = 77 - j120 \Omega$ and characteristic impedance is $Z_0 = 50 \Omega$ .		3,4	Ap
<b>Q 2</b>	<b>Solve any two questions out of three: (05 marks each)</b>	<b>10</b>		
a)	Explain isotropic antenna, Omni-directional antenna and directional Antenna. Also, show that directivity of isotropic antenna is equal to 1.		4	Ap
b)	Design a 6 element Yagi-uda antenna with folded dipole to provide a gain of 12 dBi if the operating frequency is 500 MHz.		5	Ap
c)	Describe parabolic reflector antenna and its different feeding method.		6	U
<b>Q.3</b>	<b>Solve any two questions out of three. (10 marks each)</b>	<b>20</b>		
a)	1. Find div D at the origin if $D = e^{-x} \sin y \, ax - e^{-x} \cos y \, ay + 2z \, az$ 2. Write a short note on continuity equation and Coulombs Law.		1	Ap
b)	Two lossy lines are to be joined by end to end. The first line is 20 m long and has a loss rating of 0.20 dB/m. The second line is 25 m long and has a loss rating of 0.10 dB/m. The reflection coefficient at the junction (line 1 to line 2) is $\Gamma = 0.30$ . The input power to (to line 1) is 100 mW. (a) Determine the total loss of the combination in dB. (b).		3	Ap

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Date of Exam: <del>11.03.25</del> <b>05-2-25</b>	Duration: 2.5 Hours <span style="float: right;">Max. Marks: 60</span>

	Determine the power transmitted to the output end of line 2.			
c)	Explain the formation of inversion layer in troposphere.		5	U
<b>Q.4</b>	<b>Solve any two questions out of three. (10 marks each)</b>	<b>20</b>		
a)	State and explain Poynting theorem and Maxwell's equations in point and integral form.		2	Ap
b)	Design a log periodic dipole array (LPDA) is to be designed to cover the frequency range 54-216 MHz and have a gain of 8 dB. The input impedance is 50 $\Omega$ . Calculate the required element length and spacing for optimal design. Also, explain the concept of LPDA. ( $\rho = 0.157, \Gamma = 0.865$ )		5	Ap
c)	Solve for the length (L), extension in length ( $\Delta L$ ), effective dielectric constant ( $\epsilon_{\text{eff}}$ ) and width (W) of RMSA at 2.45 GHz Bluetooth operating frequency considering FR4 substrate with $\epsilon_r = 4.4$ and thickness of 1.6 mm. Also, compare the RMSA with CMSA.		6	Ap

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