

July - Aug May-June 2024-25

B. Tech. Program: Electronics and Telecommunication Engg. Scheme: IIB

**Supplementary** Regular Examination: TY Semester VI

Course Code: EXC601 and Course Name: Electromagnetics and Antenna

Date of Exam: 05-08-25

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
Q 1	Solve any two questions out of three: (05 marks each)	10		
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 <sub>L</sub> = 77-j120 Ω and characteristic impedance is Z <sub>0</sub> = 50 Ω.		3,4	Ap
Q 2	Solve any two questions out of three: (05 marks each)	10		
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
Q.3	Solve any two questions out of three. (10 marks each)	20		
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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	Determine the power transmitted to the output end of line 2.	20		
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>			
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. ( $\ell_0 = 0.157, \Gamma = 0.865$ )		5	Ap
c)	Solve for the length (L), extension in length ( $\Delta L$ ), effective dielectric constant ( $\epsilon_{eff}$ ) 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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