Reg No.:_____ Name:_____

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Sixth Semester B.Tech Degree (S, FE) Examination January 2024 (2015 Scheme)

Course Code: EC306

Course Name:Antenna & Wave Propagation

Max. Marks: 100 Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks Marks

1 a) Derive the expressions for far field components of electric and magnetic fields of a half wave dipole. (10)

b) The radial component of radiated power density of an antenna is given as $Wrad = \frac{A_0 Sin^2\theta}{r^2}.a_r$. Find its directivity. (5)

2 a) Define effective length of a receiving antenna. Derive the expression for effective length in terms of effective aperture and radiation resistance. (5)

b) The expression for magnetic field due to a small current element '*dl*' at a distance 'r' from it is given by $H_\phi = \frac{I_m dl sin\theta}{4\pi}\left[\frac{-\omega sin\omega t_1}{cr} + \frac{\omega cos\omega t_1}{r^2}\right]$. Identify near field and far field components. Also calculate the distance at which both near and far field components becomes equal. (5)

c) Let there be two antennas A&B whose directivities and maximum effective apertures are denoted by D_a , D_b and $(A_{ea})max$, $(A_{eb})max$ respectively. How these are related together? If antenna A is isotropic antenna, derive the equations to calculate $(A_{ea})max$ and D_b. (5)

3 a) Explain the method used to measure impedance of an antenna which operates at a frequency i) below 30MHZ

ii) above 1000MHz (8)

b) An antenna has a radiation resistance of 72Ω, a loss resistance of 18Ω and a power gain of 12db. Determine the antenna efficiency and directivity. (7)

PART B

Answer any two full questions, each carries 15 marks

4	a)	Design an array of n isotropic sources of equal amplitude and spacing (end fire case). Find the directions of pattern maxima and minima for n=4 and spacing = $\lambda/2$.	(10)
	b)	Explain Cassegrain antenna and state any two advantages of it.	(5)
5	a)	ExplainDolph– Tchebyshevarray. How optimum pattern can be obtained using Tchebyshev polynomial.	(10)
	b)	Explain parabolic dish antenna. Draw its diagrams on transmitting and receiving mode.	(5)
6	a)	Which antenna has the shape of a rhombus? Draw the diagram and explain the construction and working along with the design parameters	(10)
	b)	Explain the principle of pattern multiplication with a suitable example.	(5)

PART C

Answer any two full questions, each carries 20 marks

7	a)	Explain the structure of log periodic antenna. Name its regions of operations and explain each of them briefly.	(10)
	b)	What is super refraction? Explain how it happens in atmospheric duct with the help of necessary diagrams	(10)
8	a)	Explain patch antenna. State the patch parameters and explain the feeding techniques.	(15)
	b)	Explain ground wave propagation? State any two disadvantages.	(5)
9	a)	What is meant by space wave propagation? Derive the expressions for line of sight distance and field strength at a distance for space wave propagation.	(15)
	b)	Explain base station antennas and handset antennas.	(5)

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