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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SECOND SEMESTER M.TECH DEGREE EXAMINATION, APRIL/MAY 2018

Branch:

Electronics and Communication Engineering

Stream(s):

1. **Microwave & Television Engineering**
2. **Telecommunication Engineering**

Course Code & Name:

01EC6204 Antenna Theory and Design

Answer *any two full* questions from *each* part

Limit answers to the required points.

Max. Marks: 60 Duration: 3 hours

PART A

1. a. Using Lorentz condition show that $\nabla^2 A + k^2 A = -\mu J$ 3

   b. Explain omega match 3

   c. Calculate the Directivity of an antenna with field pattern given by 3

$$E = E_\theta = \frac{\mu}{4\pi r} e^{-jkr} \cos^2\phi \sin^2\theta, \quad 0 \le \theta \le \pi, \ 0 \le \phi \le 2\pi$$

2. a. Derive Expression for far filed pattern , and directivity of a half wave dipole antenna 3

   b. Explain the optimum design of Rhombic antenna 3

   c. Derive expression for input impedance of a Folded dipole antenna 3

3. a. Derive expression for far filed pattern , radiation resistance and directivity of a general circular loop antenna 5

   b. Design an axial mode helical antenna for directivity 28dBi for operating at 600MHz. Calculate the radiation resistance, HPBW,BWFN and bandwidth of the designed antenna. 4

PART B

4. a. Derive Halen's integral equation 3

   b. Explain solution of Halen's integral equation using delta gap model. 3

   c. Derive expression for far field pattern of an open ended wave guide 3

5.	a.	Derive expression for self and mutual impedance of couple dipole antennas	5
	b.	Derive expression for filed pattern of an Yagi -Uda antenna	4
6.	a.	Derive expression for far field pattern and directivity of a horn antenna.	3
	b.	Explain Horn design algorithm	3
	c.	Design a micro-strip patch antenna for 2.4Ghz . The patch substrate has a dielectric constant 2.2 with height 2.2mm	3

PART C

7.	a.	Derive Rumsey Principle for frequency independent antennas.	6
	b.	Explain array design using Woodward-Lawson Frequency-Sampling Design	6
8.	a.	Derive general expression for array factor of non isotropic antennas.	4
	b.	Explain Butler Matrix Beam Forming	4
	c.	Explain design steps of a log periodic dipole antenna	4
9.	a.	Design a 5 element Dolph- Chebyshev array with peak side lobe level 22dB	4
	b.	Explain array design using Schelkunoff's zero placement method.	4
	c.	Derive expression for directivity of an end fire array.	4