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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SECOND SEMESTER M.TECH DEGREE EXAMINATION, MAY 2016

Electronics and Communication Engineering

(Microwave and TV Engineering)

01EC6204: Antenna Theory and Design

Max. Marks: 60 Duration: 3 Hours

*Answer **any two** questions from each PART*

Part A

1. a) An antenna with overall length $l = 5\lambda$, the observations are made at $r = 60\lambda$. Find the errors in phase and amplitude using far field approximation. (4.5)

   b) Derive the expression for power density, radiation resistance, and directivity of circular loop antenna. (4.5)

2. Explain design procedure of gamma match. (9)

3. a) Derive the vector potential for an electric current source J. (4.5)

   b) Derive radiated fields for a circular loop of constant current. (4.5)

Part B

4. Explain field equivalence principle and give the step to form an equivalent and aperture problem. (9)

5. Design a Yagi-Uda array with a directivity of 9.2 dB at $f_o = 50$ MHz. The desired diameter of the parasitic elements is 2.54 cm and of the metal supporting boom 5.1cm. Find the element spacing, lengths and total array length. (9)

6. a) Derive the self and mutual impedance of two parallel Centers driven coupled dipole antennas. (4.5)

   b) Design an aperture antenna, with uniform illumination, so that the directivity is maximized at an angle 30^0 from the normal to the aperture. Determine the optimum dimension and its associated directivity when the aperture is (4.5)

      a) square

      b) circular

Part C

7. a) Calculate the half-power beam width and directivity for the Dolph-Tscebyscheff array of lobe ratio 26dB for a spacing of $\lambda/2$ between the elements. (6)

   b) Derive the array factor of 90^0 corner reflector. (6)

8. Why equiangular spiral antenna and log periodic antennas are called frequency independent antennas. Explain their working. (12)

9. Design a broadside Dolph-Tschebyscheff array of 10 elements with spacing d between the elements and with a major to minor lobe ratio of 26dB. Find the excitation coefficients and form the array factor. (12)

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