Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SIXTH SEMESTER B.TECH DEGREE EXAMINATION, APRIL 2018

Course Code: EC306

Course Name: ANTENNA AND WAVE PROPAGATION (EC)

Max. Marks: 100 Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks. Marks

1 a) State and Prove Reciprocity Theorem as applied to Antennas. (8)

b) Explain the concept of retarded potentials. (4)

c) Define Antennae Temperature. (3)

2 a) Derive expressions for the Far Field components and Radiation Resistance of a half wave dipole. (12)

b) Define Gain and Directivity of an antenna. (3)

3 a) Derive expressions for beam solid angle in terms of Directivity of an Antenna. (4)

b) Distinguish between Effective Aperture and Physical Aperture of an antenna. (4)

c) Draw an experimental setup and explain how radiation pattern measurement of an antenna is carried out. (7)

PART B

Answer any two full questions, each carries 15 marks.

4 a) State the Principle of Pattern multiplication. Explain and illustrate the principle with an N element array. (7)

b) With a neat diagram explain the principle of operation of a Horn antenna (4)

c) Explain the importance of Cassegrain Antennae. (4)

5 a) Derive expressions for array factor of an N element linear uniform array and obtain its maximum value. (6)

b) Explain the construction and working of Rhombic Antenna (6)

c) Explain the basic Principle of Beam Steering. (3)

6 a) Design a broadside Dolph –Tschebyscheff array of 8 elements with spacing of d= $\lambda/2$ between the elements and major to minor lobe ratio of 25 dB. (10)

b) Derive expressions and plot the pattern for the field radiated by two isotropic point sources fed with current of same magnitude and phase. (5)

PART C

Answer any two full questions, each carries 20 marks.

7 a) Explain the axial mode and normal mode of operation of a helical antenna. (6)

b) A television transmitting antenna mounted at a height of 120m radiates 15kW of power equally in all directions in azimuth at a frequency of 50MHz .Calculate (i) maximum line of sight range (ii) the field strength at a receiving antenna mounted at a height of 16 m at a distance of 12 km and (iii) distance at which the field strength reduces to 1mV/m. (8)

c) Explain Tropospheric scatter propagation. (6)

8 a) Design a rectangular microstrip antenna using a substrate with a dielectric constant of 2.25 and operating at 9 GHz. Take Height of Substrate (h = 0.16 cm). (10)

b) Derive an expression for the LOS distance in km when the antenna heights above ground are h_t and h_r respectively for the transmitter and receiver Antenna. (5)

c) Differentiate between critical frequency and maximum usable frequency. (5)

9 a) With the help of neat diagrams explain the principle of operation of Log Periodic Antenna. (8)

b) What are the requirements for an antenna used in a mobile handset? Give some typical antennas used in cellular handsets. (6)

c) Explain the diversity techniques employed in wave reception. (6)

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