

Roll No:

Total No. of Questions : 09]

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Paper ID [EC303]

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B.Tech. (Sem. - 5th)

ANTENNA & WAVE PROPAGATION (EC - 303)

Time : 03 Hours

Maximum Marks : 60

Instruction to Candidates:

- 1) Section - A is **Compulsory**.
- 2) Attempt any **Four** questions from Section - B.
- 3) Attempt any **Two** questions from Section - C.

Section - A

Q1)

(10 × 2 = 20)

- a) Draw the charge and current distribution for a chain of Hertzian dipoles and how they contribute for radiation.
- b) Draw the two dimensional top view and side view of omni directional and isotropic radiation pattern.
- c) Define directive gain of antenna. Write expression of radiation resistance of a dipole antenna.
- d) How do reflections from the ionosphere effect the transmission?
- e) A rectangular aperture with a constant field distribution, with $a = 3\lambda$ and $b = 2\lambda$, is mounted on an infinite ground plane. Compute FSLBW and FSLMM in the E-Plane.
- f) What is virtual height and how is this important in transmission or receiving signals.
- g) Define field equivalence principle.
- h) Differentiate between planer and linear array.
- i) What is critical frequency and write expression for the critical frequency in terms of ionization density.
- j) Define superdirectivity. What will be the vale of directive gain (in dB) for a super directive antenna?

Section - B

(4 × 5 = 20)

- Q2) Explain the concept of polarisation in antennas. What are the conditions for different type of polarisations? Also show that circular polarization is a condition of elliptical polarization.
- Q3) The maximum radiation intensity of a 90% efficiency antenna is 200 m W /unit solid angle. Find the directivity and gain (dimensionless and in dB) when the
- (a) Input power is 125.66 mW.
 - (b) Output power is 125.66 mW.
- Q4) How does E and H field components vary in near, intermediate and far field, for an infinitesimal current carrying dipole.
- Q5) If the antenna enters the ionosphere, what changes will occur in the performance of antenna. Does earth's magnetic field affect it? If yes, how.
- Q6) Explain self and mutual impedance. What is the importance of impedance in antennas?

Section - C

(2 × 10 = 20)

- Q7) A half wave dipole radiator is elevated 50 ft above the ground. A receiving dipole 2 miles distant is elevated 15 ft. Determine the space and surface wave field strengths at the receiving antenna. When the transmitting antenna carries a current of 1 ampere at a frequency of 50 MHz. Assuming an average earth having $\epsilon_r = 15$ and $\sigma = 5 \times 10^{-3}$.
- (a) For vertical half wave dipole and
 - (b) For horizontal half wave dipole.
- Q8) Describe the working of Slot and reflector antenna. Derive the expressions for the radiation resistance of these antennas.
- Q9) What are different types of arrays? Derive the expression for the directivity of an n element ordinary end fire linear array.

