Roll No. ⬚⬚⬚⬚⬚⬚⬚⬚⬚⬚⬚   **Total No. of Pages : 02**

Total No. of Questions : 09

B.Tech (ECE)   (Sem.–5)
ANTENNA AND WAVE PROPAGATION
Subject Code : EC-303
Paper ID : [A0312]

Time : 3 Hrs.   **Max. Marks : 60**

INSTRUCTIONS TO CANDIDATES :
 1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
 2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
 3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1.   **Answer briefly :**

 a. Why practically isotropic radiator cannot exist?

 b. What is the difference between Dipole and Monopole?

 c. Compare the broad side and an end fire arrays.

 d. The critical frequency at a particular time is 11.6 MHz. what is the MUF for a transmitting station if the required angle of incidence for propagation to a desired destination is 70°.

 e. Define skip distance.

 f. Ground wave communication is most effective in what frequency range?

 g. Explain Antenna Temperature.

 h. What is the highest frequency that will be returned to earth 1000 km from transmitter by the E layer?

 i. Roughly sketch the current distribution along each arm of a dipole whose total length is 5/8 λ.

 j. Find the directivity of antenna having a power gain of 45 dB and an efficiency of 90%.

SECTION-B

2. The radiation intensity of an antenna can be approximated by

$$U(\theta,\phi) = \begin{cases} \cos^4\theta, & 0 \le \theta \le \pi/2 \\ 0, & \pi/2 \le \theta \le \pi \end{cases} \quad \text{with } 0 \le \phi \le \pi/2$$

Determine the maximum effective aperture (in m^2) of the antenna if its frequency of operation is f = 10GHz.

3. Explain the principle of multiplication of patterns.

4. Write short notes on the following :

    a. Horn antenna.

    b. Field Equivalence principle.

5. What is critical frequency for reflection at vertical incidence if the maximum value of electron density is 1.24×10^6 cm^{-3}?

6. Show that a layer can reflect a radio wave of frequency higher than the critical frequency if the wave is obliquely incident on the layer.

SECTION-C

7. Show that the velocity of transverse motion of e.m. wave through space is given by

$$v = \frac{c}{\sqrt{1 - \frac{Ne^2}{m \in \omega^2}}}$$

Where c= Velocity of e.m. waves in vacuum.   N= Number of electrons/sq. m.

E= charge on electron   M= Mass of electron.

8. a. What is the highest frequency that will be returned to earth 1000 km from the transmitter by the E layer?

    b. Both very long waves and short waves can be used for worldwide radio communication. Give general account of the propagation phenomena involved in the two cases and discuss the advantages and disadvantages of the two systems.

9. Deduce expression for the radiation pattern of a uniform linear array of N- half wave dipole. Explain what is meant by end fire and broadside arrays.