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**PRESIDENCY UNIVERSITY
BENGALURU**

**SCHOOL OF ENGINEERING
MID TERM EXAMINATION - APR 2023**

Semester : Semester VI -2020

Course Code : ECE3112

Course Name : Sem VI - ECE3112 - Antenna and Microwave Engineering

Program : ECE

Date : 17-APR-2023

Time : 11:30AM - 1PM

Max Marks : 60

Weightage : 30%

Instructions:

- (i) Read all questions carefully and answer accordingly.
 - (ii) Question paper consists of 3 parts.
 - (iii) Scientific and non-programmable calculator are permitted.
 - (iv) Do not write any information on the question paper other than Roll Number.
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PART A

ANSWER ALL THE QUESTIONS

(5 X 2 = 10M)

1. What is the relation between effective aperture and directivity of an antenna?

(CO1) [Knowledge]

2. What type of field does the transmitting antenna convert the transmitted output power into?

(CO1) [Knowledge]

3. What is the relationship between antenna size and wavelength?

(CO1) [Knowledge]

4. Is a horn antenna a directional antenna or an omni-directional antenna?

(CO2) [Knowledge]

5. Identify the antenna which radiates power equally in all directions.

(CO2) [Knowledge]

PART B

ANSWER ALL THE QUESTIONS

(3 X 10 = 30M)

6. Let us consider a half-wave dipole antenna which is a strategically designed structure in which electric and magnetic fields are initially contained in the transmission line in the form of standing waves and thereafter it separates from the dipole antenna and radiates in the free space as shown in Fig.1. If the input frequency of AC voltage source is doubled, what will be the effect on the frequency and wavelength of the radiated fields? What is the condition of I_1 (current) on the dipole structure such that fields are detached?

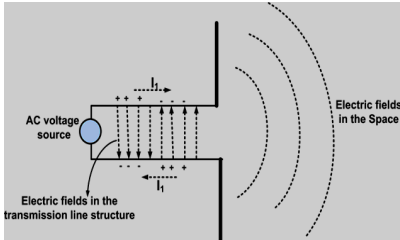


Fig. 1. Diagram showing the general field view of a dipole antenna

(CO1) [Comprehension]

7. The power radiated by a lossless antenna is 10 watts. The directional characteristics of the antenna are represented by the radiation intensity of
- $$U = U_0 (\cos^3 \theta), 0 \leq \phi \leq 2\pi, 0 \leq \theta \leq \frac{\pi}{2}.$$
- Find the following far-field parameters
- Maximum power density at a distance of 100 m.
 - Maximum directivity
 - Maximum Gain and efficiency.

(CO1) [Comprehension]

8. The antenna is constructed using conducting wire and is famous for circularly polarized waves. It is designed to operate in very high and ultra-high frequency bands (300 MHz - 3GHz). Identify the antenna and explain their construction with modes of operation.

(CO2) [Comprehension]

PART C

ANSWER ALL THE QUESTIONS

(2 X 10 = 20M)

9. The directivity of an antenna is the measure of the concentration of an antenna's radiation pattern in a particular direction and is generally expressed in dB. The higher the directivity, the more concentrated or focused is the beam radiated by an antenna. Suppose you have an antenna whose directivity in a particular direction is 20 dB that is excited with a 50 V power source and produces a radiation intensity of 50 Watts/steradian in the direction of maximum radiation. Find the input resistance of the antenna.

(CO1) [Application]

10. The helical antenna is an example of a wire antenna and is shaped as a helix. It is the simplest antenna which provides circularly polarized waves and used in extra-terrestrial communications in which satellite relays etc., are involved. Calculate the axial length of a helical antenna where the diameter of the helix is 2 cm, pitch angle is 45° and the number of turns is 10.

(CO2) [Application]