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National Institute of Technology, Hamirpur (HP)
B.Tech. (DD) END Semester Examination (Nov.-2023)

Branch: B.Tech. (DD)
Subject: Advanced Antenna Design
Time: 3 Hours

Semester: VII
Subject Code: EC-704
Maximum Marks: 50

Note: All Questions are compulsory, use of scientific calculator is permitted. Assume missing data.

- Q. 1 Calculate the r components of the electric field intensities at $x = 100 \text{ m}$, $y = 100 \text{ m}$, and $z = 100 \text{ m}$ produced by a Hertzian dipole of length $dl = 1 \text{ m}$ kept at the origin, oriented along the z -axis, excited by a current of $i(t) = 1 \times \cos(10\pi \times 10^6 t) \text{ A}$, and radiating into free space. Let the θ as 54.73 degree. [5M]
- Q. 2 Calculate the radiation resistance and the efficiency of a Hertzian dipole of length $dl = 0.05\lambda$, having a loss resistance of 1Ω , a reactance of $-j100 \Omega$, and radiating into free space. If the dipole is connected to a 100 V (peak voltage) source having a source impedance of 50Ω , calculate the real power radiated by the antenna and the power generated by the source. [5M]
- Q. 3 Show that the radiation resistance of a half wavelength dipole is $80\pi^2(l/\lambda)^2$ Ohms. [5M]
- Q. 4 For a circular aperture on ground plane. Calculate the equivalent field distribution (analytical and graphical) and sheet currents. [5M]
- Q. 5 Write the short note on electromagnetic horn antenna configurations. [5M]
- Q. 6 What is frequency independent antenna? Discuss the principle of log periodic antenna. [5M]
- Q. 7 To obtain the circular polarization, discuss the various feed arrangements/slight modifications made to the elements? [5M]
- Q. 8 Explain the fundamental limit of electrically small antennas. Discuss the different ongoing techniques for antenna miniaturization. [5M]
- Q. 9 Estimate the array factor for N-element linear array of uniform spacing and nonuniform amplitude. [5M]
- Q. 10 How does a smart-antenna system work? Explain the human analogy and its electrical equivalent. [5M]