

Roll No.:.....

National Institute of Technology, Delhi

Name of the Examination: B.Tech.

Branch : ECE

Semester : 6th

Title of the Course : Antenna and wave
propagation

Course Code : EC352

Time: 3 Hours

Maximum Marks: 50

Note :

Guidelines:

The question paper divided into three sections A, B and C and each section have following type of questions

- Section A: Carry 5 parts of 02 marks each and all parts are compulsory.
- Section B: Contains Five (05) questions of 5 marks each and any four (04) are to be attempted.
- Section C: Contains Three (03) questions of ten (10) marks each and any two (02) are to be attempted.

Section A

1.

- Describe the importance of impedance matching and its disadvantages in the antenna system. 2
- Define electric scalar potential and magnetic vector potential. Write their expressions for time varying electromagnetic fields assuming electric current source J . 2
- While designing dipoles for the practical applications such as GSM, the total length of half wave dipole antenna is kept as $0.46 \cdot \lambda$ instead of $0.5 \cdot \lambda$. Why? 2
- Find the free space loss for the communication at a distance of 150 km from a T_x operating at 50 GHz. Also calculate the received power at the receiver if $P_t = 200$ Watt and gain of the T_x and R_x antennas are 30 dB and 25 dB respectively. 2
- A hypothetical isotropic antenna is radiating in free space. At a distance of 1 km from antenna the total electrical field is measured to be 2 V/m. Find the (i) power density (ii) power radiated. 2

Section B

- Explain in details the significance of Faradays law in the radiation mechanism of the dipole. 5
- Define total antenna efficiency and explain all the parameters on which antenna efficiency depends. 5
- Describe the importance of reflectors and directors in Yagi-Uda antenna and also explain the working Principle of Yagi-Uda antenna. 5

5. An antenna of gain 35 dB is to be tested at 10 GHz. The source antenna of gain 20 dB is placed 200m away from it. The receiver sensitivity is -100 dBm. Determine the minimum transmitted power that is needed for dynamic range of 50 dB.

5

6. Find the array factor, nulls and maxima conditions for N element uniform linear array.

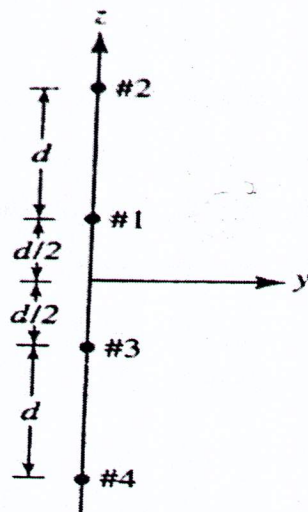
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Section C

7. Four Isotropic source are placed along the z-axis as shown. Assuming that the amplitude of elements #1 and #2 are +1 and the amplitude of element #3 and #4 are 180 degrees out of phase with #1 and #2, find

10

- The array factor in simplified form
- All the nulls when $d = \lambda/2$



8. A 1 m long dipole antenna is driven by 150 MHz source having a source resistance of 50 Ohms and voltage of 50 Volts. If the ohmic resistance of antenna is given by $R_L = 0.5$ Ohms, find current going into the antenna, power dissipated by the antenna, power radiated by the antenna and radiation efficiency of the antenna.

10

9. Calculate the number of maxima and nulls of an array factor of 2 element array with excitation having a progressive phase shift kd where k is phase constant and d is the element spacing which is equal to λ . Determine the direction of maximum and nulls as well.

10