



ANTENNAS



Answer the following questions:

- 1- a) Explain, what is meant by a transmitting antenna and a receiving antenna? [4 Marks]
b) Name the different types of antennas, and draw a sketch for three antennas of different types. [3 Marks]
c) What is an array antenna? [4 Marks]
d) Explain why transmission lines do not radiate electromagnetic waves in space. [4 Marks]
- 2- a) What are the antenna parameters? Name 5 of these parameters. [5 Marks]
b) Sketch the current distribution and the radiation pattern of the dipoles of the following lengths.
1- Infinitesimal, 2- Short dipole, 3- half-wave dipole,
4- 1.25λ dipole, 5- 1.5λ dipole, 6- 2λ dipole [10 Marks]
- 3- a) A hypothetical isotropic antenna is radiating in free-space, to produce a magnetic field of 50 Micro-Amp/meter, at a distance of 30 meters from the antenna. Determine: (1) the electric field intensity, (2) the power density, (3) the power intensity, and (4) the total power radiated from the source. [5 Marks]
b) Find the half-power beam-width (HPBW) and first-null beam-width (FNBW), in radians and degrees, for the following normalized radiation intensities:
(a) $U(\theta) = \cos^2 \theta$
(b) $U(\theta) = \cos^3 \theta$

[10 Marks]

- 4- a) In an electromagnetic wave, what is travelling away from the source? [5 Marks]
 b) A dipole of length 10 meters is operating at a frequency of 5 MHz; If the peak of the current at the input of this dipole is 1 amp, determine the total power radiated.
 What are the magnetic field strength, the electric field strength (rms values) and the power intensity at an angle of 60° from the dipole axis and at a distance of 50 meters?

[10 Marks]

- 5- For the straight wire monopole shown in Fig.1, determine the magnitude and direction of the electric field and the magnetic field at a field point P₁ at a distance of 200 meters away from the feed point of the antenna and on the Z-axis. Also, find the magnitude and direction of the electric field and magnetic field at a field point P₂ at a distance of 200 meters away from the feed point but on a direction of 45° from the Z-axis. Determine the power density, the power intensity and the direction of flow of power at the two points. [15 Marks]

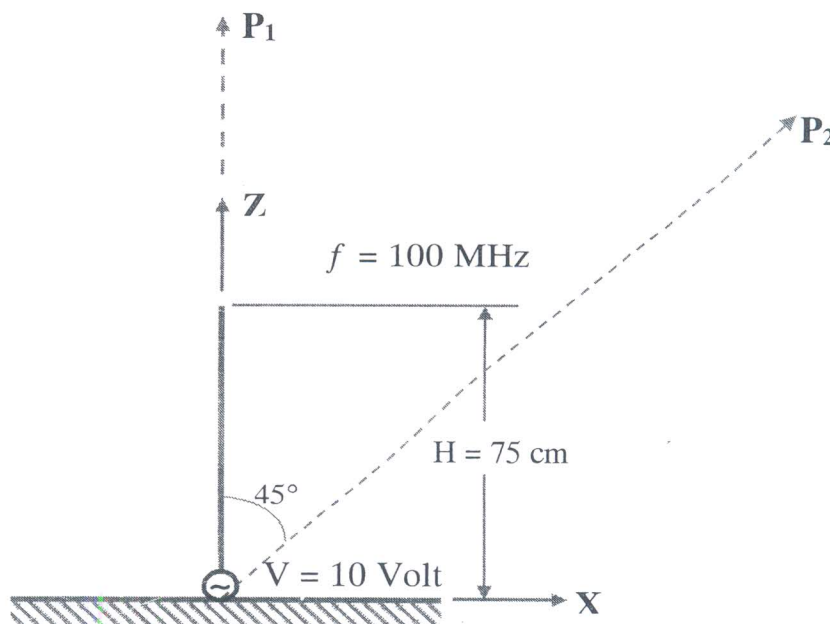


Fig. 1 (For question 4)

- 6- a) Why people usually use a half-wave dipole? [5 Marks]
 b) Sketch the radiation patterns of two isotropic sources fed with equal currents and arranged at the following conditions of spacing and phasing:-
 (i) $d = \lambda/2, \alpha = 0^\circ$ (ii) $d = \lambda/2, \alpha = 180^\circ$
 (iii) $d = \lambda/4, \alpha = 90^\circ$ (iv) $d = \lambda, \alpha = 0^\circ$

[10 Marks]

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 (Good Luck)