

CS/B.Tech/Even/ECE/6th Sem/EC-604A/2014

2014

Antenna Theory & Propagation

Time Alloted : 3 Hours

Full Marks : 70

*The figure in the margin indicate full marks.
Candidates are required to give their answers in their
own words as far as practicable*

GROUP - A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any ten of the following:

10x1=10

- i) The induction field of short current element varies as
 a) $1/r^2$ b) $1/r$
 c) $1/r^3$ d) r^2
- ii) The radiation resistance of a $\lambda/2$ antenna in free space is given by
 a) 377 ohms b) 73 ohms
 c) 36.5 ohms d) none of these
- iii) Fields are said to be elliptically polarized if their magnitudes are
 a) Equal & they are in phase
 b) Equal & they differ in phase by 90°
 c) Unequal & they differ by 90°
 d) Not equal but they are in phase

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- iv) The current distribution in half-wave dipole is
 a) Constant b) Sinusoidal
 c) Triangular d) None of these
- v) An antenna has a gain of 40dB at a frequency of 300 MHz. The effective area of the antenna in square meter is
 a) 796 b) 10000
 c) 2500 d) 3183
- vi) Circularly polarized antenna is
 a) Dipole b) Helical
 c) Yagi-uda d) Parabolic dish
- vii) Radar antennas are usually
 a) Dipole b) Parabolic dishes
 c) Helical d) None of these
- viii) Band width of antenna is
 a) Directly proportional to Q
 b) Inversely proportional to Q
 c) Not related to Q
 d) None of above
- ix) The radiation pattern of loop antenna is
 a) Circle b) Semi-circle
 c) Cardioid d) None of these
- x) Television receiver antennas are usually
 a) Loop antenna
 b) Yagi antenna
 c) Parabolic dishes
 d) Rhombic antenna
- xi) Which of the following antenna array gives direction of maximum radiation in perpendicular to the line of array axis?
 a) Broad side array
 b) End-fire array
 c) Collinear array
 d) Parasitic array

xii) Directivity of antenna

- a) Directly proportional to Beam-width
- b) Inversely proportional to Beam-width
- c) Not related to Beam-width
- d) None of these

GROUP - B**(Short Answer Type Questions)**Answer any *three* of the following.

3x5=15

2. (i) Define retarded vector potential.
(ii) Find the power density in W/m^2 , at a distance of 20 km from an antenna that is radiating 5kW with a directivity of 36dB.
3. (i) Discuss the advantages and disadvantages of micro strip antenna.
(ii) At a distance of 10 m the maximum radiated power is measured to be $160\mu W/cm^2$. If the antenna is radiating 120W of power, calculate the antenna gain.
4. (i) What is radiation resistance of an antenna?
(ii) Derive line of sight distance in space wave propagation.
5. What is pattern multiplication technique?
6. Find the gain of an antenna with a circular aperture of diameter 3 metres at a frequency of 5GHz.

GROUP - C**(Long Answer Type Questions)**Answer any *three* of the following.

3x15=45

7. (a) What is the vector potential and retarded vector potential?
(b) Define gain, directivity and efficiency of antenna.
(c) The radiation resistance of an antenna is 80Ω and loss resistance is 10Ω . Determine efficiency, directivity if the power gain is 20. Also find out the beam solid angle.

[(2+3)+(2+2+2)+(1+2+1)]

8. Explain the operation of Helical antenna in Axial mode and normal mode. Show that radiation resistance of folded dipole is four times the radiation resistance of single dipole. Explain the design aspects of Yagi-Uda antenna.

[(7+3+5)]

9. What is Duct Propagation? Determine the Skip distance in sky wave propagation. What is radio horizon? Define virtual height? What is maximum usable frequency?

[(3+5+2+2+3)]

10. (a) Define MUF, Critical frequency and virtual height.

(b) At what frequency a wave must propagate for the D region to have an index of refraction 0.6? Given $N = 500$ electron/cc for D region.

(c) In a communication link two identical antennas at 10 GHz and used propagation of 40 dB. If the transmitted power is 1 W find the received power if the range of the link is 30 Km.

[(2+2+3)+3+5]

11. Write Short notes on any three of the following:

[(3X5)]

- a) Duct Propagation
- b) Fading in Sky wave propagation
- c) Yagi-Uda antenna
- d) Polarization
- e) Skip Distance
- f) Horn Antenna