

BETCE 3rd Year, 1st Semester Supple Examination 2017

Subject: Antenna & propagation

Time: Three hours

Full Marks: 100

Answer any five questions taking at least two from each part
Answer must be written at one place for each attempted question

Part -A

Q1. (a) Write four Maxwell's equations for EM waves and explain their significance.

(b) From Maxwell's equation define vector magnetic potential **A** and derive the Helmholtz wave equation.

(c) What are the sources of EM radiation. 8+8+4

Q2. (a) Show how a simple Dipole antenna can be derived from the transmission line. What will be the impedance transformation from transmission line to antenna point?

(b) Derive the expressions for **E** and **H** field components of thin Dipole antenna considering sinusoidal current distribution. From that derive the **total power** radiated by the antenna and show that **radiation resistance** for dipole antenna is 73 Ohm.

(c) Draw the **E-field** and **H field** pattern of the Dipole antenna. 6+10+4

Q3. (a) Find the expression for Array Factor (AF) for N element uniform array antenna. From that get the expression for AF for 2-elements antenna array. Explain the principle of pattern multiplication.

(b) What are primary and secondary lobes in the array pattern? Explain with pictorial representation. What is the first side lobe level of a uniform N elements array, when N is large?

(c) An array comprises two Hertzian dipoles that are separated by half wavelength. If the dipoles are fed by currents of the same magnitudes and phase,

I. Find the array factor

II. Calculate the angles where the nulls of the pattern occur

III. Determine the angles where the maxima of the pattern occur

IV. Sketch the group pattern in the plane containing the elements 8+6+6

Q4. (a) Define the radiation intensity, directive gain and power gain and efficiency of an antenna.

(b) Show that Yagi-Uda antenna produces end-fire radiation.

(c) Show that 5 elements binomial array will not produce any side lobe. 8+6+6

Part B

Q.1.

(a) What is Huygen's principle? Describe the generation of Cornu Spiral for observing the diffraction effects.

(b) Describe different types of Fading.

[4+6+10=20]

Q.2.

(a) Proof that for perfect communication in LOS, the earth's radius has to be increased by $4/3$ amount.

(b) Describe the Path Gain formula and write the definition of coverage diagram

[10+10=20]

Q.3

(a) Explain the properties of D and F layer. How F layer is divided in day time?

(b) Explain the electrical properties of Ionosphere in presence of earth's magnetic field.

[6+4+10=20]

Q.4.

(a) Describe the standard atmospheric model and what is evaporation duct

[5+5=10]

(b) What is the process for absorption of different gas by atmosphere? Define Link

Budget

[8+2=10]