10TE63

Sixth Semester B.E. Degree Examination, Aug./Sept.2020
Antenna and Propagation

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions, selecting atleast TWO questions from each part.*

PART – A

1   a. Derive FRII's Transmission Formula. **(05 Marks)**
    b. Explain the following parameters that are related to antenna :
       i) Directivity   ii) Radiation Intensity   iii) Beam width. **(09 Marks)**
    c. A parabolic reflector antenna is circular in cross – section with a diameter 1.22m. If the maximum effective aperture equals 55% of the physical aperture. Calculate gain of the antenna in dB at 20GHz. **(06 Marks)**

2   a. State and prove Power Theorem. **(05 Marks)**
    b. Obtain the value of Electric field intensity in the case of array of 'n' Isotropic sources. **(08 Marks)**
    c. Calculate the distance between the elements of a broadside array whose beam width between first nulls is found to be 45^0 at a frequency of 10MHz. There are 8 elements in the array. **(07 Marks)**

3   a. Derive an expression for radiation resistance of a short electric dipole. **(08 Marks)**
    b. Explain following antenna with relevant figures :
       i) Folded dipole Antenna   ii) Long – wire Antenna. **(08 Marks)**
    c. Calculate the radiation resistance of an antenna of length $\lambda/10$ m and $\dfrac{\lambda}{50}$ m. **(04 Marks)**

4   a. Derive the equation for impedance of a slot antenna in terms of the impedance of the complementary dipole antenna. **(08 Marks)**
    b. Explain Babinet's principle with illustration. **(04 Marks)**
    c. Derive the Far field expression for small loop antenna. **(08 Marks)**

PART – B

5   a. Describe a Helical antenna with the help of a neat diagram. Explain its 2 modes of operation with relevant figure. **(08 Marks)**
    b. Find number of elements in a log – periodic dipole array with 7dBi gain and a 4 to 1 bandwidth. The scale constant K = 1.2 for apex angle of 15^0. **(06 Marks)**
    c. Give a explanatory note on Corner Reflector. **(06 Marks)**

6   a. Explain Yagi-Uda Antenna structure with a neat diagram. **(06 Marks)**
    b. For a 20 turn Helical antenna operating at 3GHz with circumference of 10cm and spacing between one turns 0.3s is operating at 3GHz. Calculate directivity and half power beam width. **(06 Marks)**
    c. Write short notes on :
       i) Embedded Antenna   ii) Plasma Antenna. **(08 Marks)**

7   a. Derive an expression for Field Intensity in the case of space wave propagation. **(10 Marks)**

     b. Explain Duct propogation. **(05 Marks)**

     c. A free space LOS [Line – of – Sight] transmit and a receive antenna each having a gain of 25dB. The distance between the two antenna is 30 km and the power radiated by the transmit antenna is 10W. Calculate the path loss of the link and received power. **(05 Marks)**

8   a. Explain the mechanism of ionospheric wave propogation. Also derive an expression for the refractive index of ionosphere. **(10 Marks)**

     b. In Ionospheric propagation, consider that the reflection takes place at a height of 300km and that the maximum density in ionosphere corresponds to refractive index of 0.8 at 15MHz frequency. Determine ground range for curved earth for which given frequency is MUF. **(06 Marks)**

     c. Define the following terms related to ionosphere propogation :

        i) Critical frequency   ii) Skip distance. **(04 Marks)**

*****