10EC64

Sixth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Antennas 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 relationship between directive gain, effective length and radiation resistance.
                                                                            (08 Marks)
    b. Determine the directivity for the following Intensity patterns :
       i) $U = U_m \cos^2 \theta$ ii) $U = U_m \sin \theta \sin^2 \phi$; $0 \le \theta \le \pi$, $0 \le \phi \le \pi$.   **(06 Marks)**
    c. Derive Power transfer ratio using Fris Transmission formula.   **(06 Marks)**

2   a. Derive Maxima , Minima and Half power point directions in Array of 'n' elements with
       equal spacing and currents equal in magnitude with Progressive Phase Shift – End fire
       Array.   **(10 Marks)**
    b. Four isotropic sources are spaced $\lambda/6$ distance apart. They have a phase difference of $\pi/3$
       between adjacent elements. Find BWFN and MPBW.   **(10 Marks)**

3   a. Derive an expression for power radiation by current element of short dipole.   **(06 Marks)**
    b. Derive an expression for gain of a half wave Antenna.   **(08 Marks)**
    c. Explain characteristics of patch antenna.   **(06 Marks)**

4   a. State Babinet's principle and explain how it gives rise to the concept of complementary
       antenna.   **(07 Marks)**
    b. Derive an expression for Directivity of Circular Loop Antenna.   **(07 Marks)**
    c. The diameter of circular loop antenna is 0.04λ. How many turns of the antenna will give a
       radiation resistance of 36Ω?   **(06 Marks)**

PART - B

5   a. Derive an expression for pitch angle Axial ratio of helical antenna using perpendicular
       mode.   **(06 Marks)**
    b. What is basic concept of Reflector antenna? Explain different types of reflector antenna.
                                                                               (06 Marks)
    c. Explain following antenna with neat sketch :
       i)   Sleeve Antennas   ii) Omni directional Antennas.   **(08 Marks)**

6   a. Explain in brief antenna for satellite communication. What are different design
       consideration Receiver and Transmitter case?   **(10 Marks)**
    b. Explain how GPR system differ than general radar systems. What are different
       considerations for antenna used in GPR systems?   **(10 Marks)**

7   a. Derive an expression for Field strength at Receiver for Space wave propagation.   **(07 Marks)**
    b. Explain tropospheric scatter phenomenon.   **(06 Marks)**
    c. Define the following : i) Critical frequency (fc)   ii) Maximum usable frequency (MUF)
       iii) Skip distance.   **(07 Marks)**

8   a. Derive an expression for f_{MUF} for flat earth.   **(10 Marks)**
    b. In the ionospheric propagation , consider that the reflection takes place at a height 300km
       and that the maximum density in the ionosphere corresponds to a refraction index of 0.8 at a
       frequency is the MUF. Take the Earth's curvature into consideration.   **(10 Marks)**

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