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) $U = U_m \sin \theta \sin^2 \phi$; $0 \leq \theta \leq \pi$, $0 \leq \phi \leq \pi$. **(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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