



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 (f_c) 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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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

