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10EC64

Sixth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Antenna and Propagation

Time: 3 hrs.

Max. Marks:100

Note: Answer FIVE full questions, selecting at least TWO questions from each part.

PART - A

- 1 a. Define the following terms related to antenna.
(i) Radiation intensity
(ii) Directivity
(iii) Antenna field zones
(iv) Half power Beam width (HPBW) (12 Marks)
- b. The radiation intensity of an antenna is given by $u(\theta, \phi) = \cos^4\theta \sin^2\phi$ for $0 \leq \theta \leq \frac{\pi}{2}$ and $0 \leq \phi \leq \pi$, it is zero in the lower half space. Find :
(i) Exact directivity dB
(ii) Elevation half power B.W in degrees. (08 Marks)
- 2 a. Explain power theorem and its application to an isotropic antenna. (05 Marks)
b. Find the directivity of an unidirectional Cosine pattern and also show that the directivity for unidirectional operation is $2(n+1)$ for an intensity variation of $U = U_m \cos^n\theta$. (07 Marks)
c. Find the field pattern of an end fire array of 2 isotropic point source. (08 Marks)
- 3 a. Show that the maximum effective aperture of a $\frac{\lambda}{2}$ dipole is $A_{em} = 0.13\lambda^2$ and find its directivity. (10 Marks)
b. Consider a 200KHz radio transmitter feeding a 100m vertically oriented antenna. Determine its effective, height, radiation resistance radiation efficiency, Given loss resistance of the antenna R_L is 1.5Ω . (05 Marks)
c. A parabolic dish has diameter $d = 20m$ and $\eta = 0.55$. The operating frequency is 5GHz compute its gain and beam width between first nulls. (05 Marks)
- 4 a. Derive the expression for Radiation Resistance of Large Loop Antennas. (10 Marks)
b. A loop antenna has $A = 1m^2$ and $N = 10$ turns. The coil wire has $R = 10 \Omega$ and $L = 0.5mH$. It is turned by a variable capacitor to resonate with a wave of $141.4 \sin 6\pi \times 10^5 t$ $\mu v/m$. Determine the voltage developed across the capacitor when the loop is oriented at 45° . (10 Marks)

PART - B

- 5 a. Describe Helical Antenna with two modes of operation. (08 Marks)
b. Give a brief comparison between the parabolic reflector and corner reflector. (08 Marks)
c. Write a note an plasma antenna. (04 Marks)



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- 6 a. Write the diagram and explain the operation of Yagi-Uda antenna with design parameter. (08 Marks)
- b. Determine the cut-off and bandpass frequencies of a log periodic array with a design factor of 0.7. Ten dipoles are used in the structure, the least dipole having a dimension of 0.6m. (08 Marks)
- c. Write a note on Antennas on mobile Handsets. (04 Marks)
- 7 a. Derive an expression for space wave field intensity from the earth surface. (10 Marks)
- b. Explain the propagation of radio waves through different regions and also discuss the three factors which affect the propagation. (10 Marks)
- 8 a. Define the following terms related to ionospheric propagation:
i) Critical frequency
ii) Virtual height
iii) Skip distance. (09 Marks)
- b. Write a note on Troposcopic scattering. (06 Marks)
- c. Derive an expression for maximum usable frequency. (05 Marks)

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