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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)

- 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)
