B. M. S. College of Engineering, Bengaluru - 560019

Autonomous Institute Affiliated to VTU

September / October 2023 Supplementary Examinations

Programme: B.E.   Semester: V
Branch: Electronics and Communication Engineering   Duration: 3 hrs.
Course Code: 19EC5PCANT   Max Marks: 100
Course: Antenna Theory   Date: 16.09.2023

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
             2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

UNIT - I

1. a) Define an antenna. Explain the physical concept of radiation. **06**

   b) Derive the expression for received power of a radio communication link **06**

   c) An antenna has a field pattern given by $E(\theta) = \cos\theta\cos2\theta$ for $0^0 \leq \theta \leq 90^0$ find **08**
      i. Half power beam width
      ii. Beam width between first nulls

UNIT - II

2. a) Deduce an expression for radiation resistance of a short electric dipole antenna. **10**

   b) For a short dipole $\lambda/15$ long, find the efficiency, radiation resistance if the loss resistance is 1Ω. Also find the effective aperture **06**

   c) Compare the far Electric and Magnetic fields of a small loop and short electric dipole. **04**

UNIT - III

3. a) Analyse a suitable array system of two isotropic point sources in which the peak of radiation pattern is perpendicular to the array axis. **12**

   b) An Array of 4 isotropic antennas placed along a straight line. Distance between adjacent elements is $\lambda/2$. The peak is to be obtained in a direction $60°$ from the axis of the array. Compute the phase difference between adjacent elements. Complete the pattern and find the BWFN and HPBW. **08**

OR

4. a) Analyse a suitable array system of two isotropic point sources in which the peak of radiation pattern is parallel to the array axis. **12**

b) Describe the different practical distributions of a linear broadside array with non-uniform amplitude. **08**

UNIT - IV

5. a) Analyse the design considerations of pyramidal horn with the help of Fermat's Principle. Give the relations for the optimum length of the horn and optimum path length difference of the horn, also the values of the same. **12**

b) State and explain Babinet's principle with respect to antenna theory. **08**

OR

6. a) Deduce the relation for an impedance of slot antenna. **12**

b) Define a smart antenna. Explain its purpose and working, Also list any 2 merits and 2 demerits of the same **08**

UNIT - V

7. a) Describe the geometry and modes of operation of a helical antenna. **10**

b) With the help of appropriate diagram, explain the different feed methods for a parabolic reflector. **10**

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