**SHRI MATA VAISHNO DEVI UNIVERSITY, KATRA**
**School of Electronics and Communication Engineering**
**B. Tech. (ECE) Minor II Examination (ODD) 2023-24**

**Entry No:** | | | | | | | | | | |

**Date:**

**Total Number of Pages: [01]**

**Total Number of Questions: [04]**

**Course Title: Antenna & Wave Propagation**
**Course Code: ECL 2041**

**Time Allowed: 1.0 Hours** **Max Marks: [20]**

Instructions / NOTE

i. Attempt All Questions.
ii. Support your answer with neat freehand sketches/diagrams, wherever appropriate.
iii. Assume an appropriate data / information, wherever necessary / missing.

| | | | |
|---|---|---|---|
| | **Section - A** | | |
| Q1. | (i) The half power beam-width of an end-fire antenna array is _____ than that of the same sized broadside array. | [1×5] | CO2 |
| | (ii) Two isotropic radiators are placed at a distance of one wavelength. The major lobes are in the directions of ___, ___, ___, and ___, degrees. | | CO2 |
| | (iii) Using Hansen Woodyard criterion, the directivity of a 10 element antenna array with uniform spacing of quarter-wavelength can be increased upto ___dBi. | | CO2 |
| | (iv) The beamwidth between nulls of 140 cm parabolic reflector used at 6 GHz is _. | | CO3 |
| | (v) A uniform broadside array of 4 elements are placed at a distance of 3λ/8 distance from each other, the directivity is ____ dBi, approximately | | CO4 |
| | **Section - B** | | |
| Q2. | What do you mean by resonant and non-resonant antennas? Compare the salient features of these antennas in the tabular form. | [03] | CO5 |
| Q3. | (i) Draw and explain the working of a Rhombic antenna and its array. | [03] | CO4 |
| | (ii) With the neat diagram, explain the working of a Helix Antenna. What are the various modes of operation and how are they decides? | [03] | CO5 |
| Q4. | (i)There is the need of a 8.5dBi directivity log periodic antenna to operate over 10-30MHz. The value of σ, and τ are 0.166, and 0.895, respectively. Find the followings. (a) Apex Angle (2α) (b) Number of dipole elements required (c) Length of dipole elements used. | [03] | CO5 |
| | (ii) An 8-turn circular loop antenna whose radius is λ/25 is operating in the free space. Find: (a) Radiation resistance (b) Number of more turns need to increase the radiation resistance to 200Ω (c) approximate directivity of the single turn. | [03] | CO5 |

Course Outcomes

1. Able to understand the basic operation of E.M. wave based application.
2. To design and analyze various types of antenna.
3. Understand the different propagation modes of EM wave.
4. Able to find suitability of antennas for different applications.
5. To understand the different types of antennas and their applications

| CO | Questions Mapping | Total Marks | Total Number of Students (to be appeared in Exam) |
|---|---|---|---|
| CO1 | | | |
| CO2 | 1(i),1(ii),1(iii) | 03 | |
| CO3 | 1(iv) | 01 | |
| CO4 | 1(v), 3(i),3(ii) | 07 | |
| CO5 | 2,4(i),4(ii) | 09 | |

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**Course Code: ECL 2041**

**Time Allowed: 1.0 Hours** **Max Marks: [20]**

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ii. Support your answer with neat freehand sketches/diagrams, wherever appropriate.
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| | Section - A | | |
|---|---|---|---|
| Q1. | (i) If the gain and efficiency of antenna are 2.15dBi, and 9%, respectively then directivity is ___ dBi.<br>(ii) The radiation resistance of a short current filament of legth 0.12λ is ___Ω.<br>(iii) If transmitted power from the antenna and the gain are W and 4dBi, the EIRP is ___.<br>(iv) The axial ratio of the linearly polarized antenna is ___.<br>(v) Two different dipoles named Dipole#1 and Dipole #2 are radiating in the free space. The length of the Dipole #1 and Dipole# 2 are 1.0λ and 0.5λ, respectively. The ratio of the radiated electric field of Dipole#1 to Dipole#2 is ___. | [1×5] | CO1<br>CO2<br>CO1<br>CO1<br>CO2 |
| | Section - B | | |
| Q2. | What do you mean by the following antenna parameters? Explain:<br>i. Polarization<br>ii. Scattering Aperture<br>iii. Vector Magnetic Potential<br>iv. Free Space Path Loss | [04] | CO3 |
| Q3. | (i)What do you mean by the broadside and end-fire antenna array? Explain with the help of the neat diagram.<br>(ii) An elementary current filament is radiating in free space. Find the expression for the far-field electric magnetic field components. | [03]<br>[03] | CO1 |
| Q4. | (i)A current element of length 0.02λ is radiating in free space. If the required radiated power at far-field is 20dBm; determine the current in the element.<br>(ii)What is the maximum effective area of a half-wavelength dipole antenna at 500 MHz? | [03]<br>[02] | CO1<br>CO2 |

Course Outcomes

1. Able to understand the basic operation of E.M wave based application.
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3. Understand the different propagation model of EM wave.
4. Able to find suitability of antennas for different applications.
5. To understand the different types of antennas and their applications

| CO | Questions Mapping | Total Marks | Total Number of Students (to be appeared in Exam) |
|---|---|---|---|
| CO1 | 1(i),1(iii), 1(iv), 3(ii), 4(i) | 09 | |
| CO2 | 1(ii), 1(v), 4(ii) | 04 | |
| CO3 | 2, 3(i) | 07 | |
| CO4 | | | |
| CO5 | | | |