Student Exam No: _____

# GANPAT UNIVERSITY

## B. TECH. SEMESTER VI (ELECTRONICS & COMMUNICATION ENGINEERING)
## REGULAR EXAMINATION, MAY-JUNE 2014
## 2EC601 ANTENNA ENGINEERING

**[Max. Time: 3 Hrs.]** **[Max. Marks: 70]**

Instructions:

1. Attempt all questions.
2. Answers to the two sections must be written in separate answer books.
3. Figures to the right indicate full marks.
4. Assume suitable data, if necessary.

## SECTION-I

| | | | |
|---|---|---|---|
| Que.-1 | (A) | What is the broadside array? Derive the expression for the radiation pattern of a broadside array of n elements. | 6 |
| | (B) | Explain the concept of antenna coupling with necessary equations. | 6 |
| | | **OR** | |
| Que.-1 | (A) | Explain<br>1. Antenna Beam width 2. FBR 3. Antenna Beam Efficiency | 6 |
| | (B) | Explain in details<br>1. Binominal array 2. Pattern multiplication method | 6 |
| Que.-2 | (A) | Derive maxima, minima and half power point directions with two point sources are fed with currents equal in magnitude but opposite in phase. | 5 |
| | (B) | Give the different definitions of Antenna. | 3 |
| | (C) | Explain the concept of radiation intensity | 3 |
| | | **OR** | |
| Que.-2 | (A) | Derive the expression of directivity for n-element Broad side linear array | 5 |
| | (B) | Explain the classification of Antenna. | 3 |
| | (C) | For a source with radiation intensity U=6cosθ, find the directivity and HPBW, when its pattern is unidirectional. | 3 |
| Que.-3 | (A) | Design a four elements broad side array of $\lambda/2$ spacing between elements. The pattern is to be optimum with a side lobe level 18 dB down the main lobe maximum. | 5 |
| | (B) | The radiation efficiency of a certain antenna is 95 %. The maximum radiation intensity is 0.5 W/Sr. Calculate the directivity of the antenna if<br>1. $P_{input} = 0.4\,W$ 2. $P_{rad} = 0.3\,W$ | 4 |
| | (C) | Explain the different types of antenna polarization. | 3 |

## SECTION-II

| | | | |
|---|---|---|---|
| Que.-4 | (A) | Briefly explain the log periodic antenna with necessary equations. | 4 |
| | (B) | Derive the equation of maximum power gain in terms of radiation efficiency & Directivity. | 4 |

| | | | |
|---|---|---|---|
| | (C) | Explain the Yagi-Uda antenna with necessary equations. | 4 |
| | | **OR** | |
| **Que.-4** | (A) | Prove the equation: $A_{em} = 1.5\frac{\lambda^2}{4\pi}$ | 4 |
| | (B) | Explain the Loop antenna & Rhombic antenna | 4 |
| | (C) | Calculate power gain of a half wave dipole whose ohmic losses and directivity are 7Ω and 1.64 respectively. | 4 |
| **Que.-5** | (A) | Explain the Helical Antenna & Inverted V-Antenna in details. | 5 |
| | (B) | Explain the Gain measurement by Two antenna method. | 3 |
| | (C) | Explain the method for measurement of antenna beam width | 3 |
| | | **OR** | |
| **Que.-5** | (A) | Explain<br>1. Feeding techniques of parabolic reflectors<br>2. Functions of an Antenna | 5 |
| | (B) | Explain the Gain measurement by Three antenna method | |
| | (C) | Explain the corner reflector antenna in detail. | 3 |
| **Que.-6** | (A) | Define self impedance and mutual impedance of antennas. | 4 |
| | (B) | An antenna is fed with a voltage source of **(100+j80)** V with impedance **50** Ω. Calculate radiation efficiency of antenna, real power delivered by source, real power input to antenna, power radiated by antenna if antenna impedance is **(71+j25)** Ω which includes loss resistance of **1** Ω | 4 |
| | (C) | Explain the various forms of antenna arrays with neat diagrams | 4 |

**End of Paper**