*Total No. of Questions: 6* *Total No. of Printed Pages:3*

**Enrollment No.....**

Faculty of Engineering

End Sem Examination Dec 2024

EC3CO19 Antennas & Propagation

Programme: B.Tech. Branch/Specialisation: EC

**Duration: 3 Hrs.** **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning. Draw necessary diagrams**.**

| | | | Marks | BL | PO | CO | PSO |
|---|---|---|---|---|---|---|---|
| Q.1 | i. | An electric dipole is a system of two equal and opposite fixed charge carriers separated by a fix distance strength of dipole is measured by-<br>(a) Current density (b) Current displacement<br>(c) Dipole moment (d) Charge carrier count | **1** | 02 | | 01 | |
| | ii. | In an antenna radiation pattern a null is defined as a zone in which_____ is minimum.<br>(a) Directivity (b) Radiated power<br>(c) Return loss (d) None of these | **1** | 01 | | 01 | |
| | iii. | In end fire array, the direction of the maximum radiation is<br>(a) Along the axis of array<br>(b) Perpendicular to the axis of array<br>(c) Opposite to the axis<br>(d) Parallel to the axis of array | **1** | 01 | | 01 | |
| | iv. | In case of uniform linear array, to increase the directivity, the array length has to be-<br>(a) Increased (b) Decreased<br>(c) No effect (d) None of these | **1** | 03 | | 02 | |
| | v. | To increase the gain of the Yagi-Uda antenna, the number of directors is……. in the beam direction-<br>(a) Decreased (b) Increased<br>(c) Fixed (d) Both (a) and (c) | **1** | 02 | | 02 | |

| | | | | | |
|---|---|---|---|---|---|
| vi. | In which of the following mode, the radiation is perpendicular to the axis of helical antenna?<br>(a) Axial (b) Beam<br>(c) Normal (d) End fire | **1** | 02 | 03 |
| vii. | Pyramidal horn antennas have :<br>(a) Lightweight and low directivity<br>(b) Lightweight and higher directivity<br>(c) Heavy weight and high directivity<br>(d) Heavy weight and low directivity | **1** | 02 | 03 |
| viii. | CST, HFSS are:<br>(a) Types of filters<br>(b) Radiation mechanism<br>(c) Elements of antenna<br>(d) Antenna design software | **1** | 01 | 07 |
| ix. | In radio transmission MUF is-<br>(a) Mean of utilised frequency<br>(b) Maximum usable frequency<br>(c) Mode of useful frequency<br>(d) Minimized usable frequency | **1** | 01 | 07 |
| x. | Optimum Working Frequency (OWF) is -<br>(a) Statistical prediction of the highest frequency<br>(b) Related to sky wave propagation<br>(c) Used at ionosphere level.<br>(d) All of these | **1** | 01 | 06 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Q.2 | i. | What is beamwidth? | **2** | 01 | 02 |
| | ii. | Define: Gain, Directivity, Bandwidth. | **3** | 02 | 01 |
| | iii. | Explain the different radiation patterns and their representation, | **5** | 02 | 02 |
| OR | iv. | Derive Radar Range Equation and give its significance | **5** | 03 | 05 |
| Q.3 | i. | What is the concept of pattern multiplication? | **2** | 03 | 05 |
| | ii. | Describe in detail the effects of uniform and non-uniform amplitude distributions. | **8** | 04 | 05 |
| OR | iii. | Write a note on operational details of scanning array and binomial array. | **8** | 04 | 05 |



| | | | | | | |
|---|---|---|---|---|---|---|
| Q.4 | i. | Write constructional details and characteristics of Yagi - Uda antenna. | **3** | 02 | 03 |
| | ii. | State the design considerations for monomial helical antennas in axial mode and normal modes. | **7** | 03 | 04 |
| OR | iii. | Explain F/D ratio, aperture blocking. give the geometry and details off-set feeds, cassegrain feeds for parabolic reflector. | **7** | 03 | 04 |
| Q.5 | i. | Give the basic requirements of base station antenna and mobile station antenna. | **4** | 01 | 04 |
| | ii. | Describe the features of FHSS and CST tools. | **6** | 02 | 07 |
| OR | iii. | Write a short note on different types of horn antenna. | **6** | 02 | 02 |
| Q.6 | | Attempt any two: | | | |
| | i. | What is super refraction? Explain the effect of earth's magnetic field on radio wave propagation. | **5** | 02 | 06 |
| | ii. | Describe the structure of ionosphere mechanism of Ionospheric propagation. | **5** | 02 | 06 |
| | iii. | Explain virtual height, skip distance, ionosphere abnormalities. | **5** | 02 | 05 |

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[2]

[3]

# Marking Scheme
## EC3CO19 (T) Antennas & Propagation (T)

| | | | Marks |
|---|---|---|---|
| Q.1 | i | **(c) dipole moment** | **1** |
| | ii | **(b)radiated power** | **1** |
| | iii | (a) **along the axis of array** | **1** |
| | iv | **(a) increased** | **1** |
| | V | **(b)increased** | **1** |
| | vi | **(c)normal** | **1** |
| | vii | **(b)lightweight and higher directivity** | **1** |
| | viii | **(d) antenna design software** | **1** |
| | ix | **(b)maximum usable frequency** | **1** |
| | x | **(d) all of the above** | **1** |
| Q.2 | i | What is beamwidth ?<br>Definition 2 marks | **2** |
| | ii | Define: Directivity, Bandwidth, Gain.<br>*1 for each definition* | **3** |
| | iii | Explain the different radiation patterns and their representation .<br>*All the types 2.5 ,radiation pattern plot for all 2.5* | **5** |
| OR | iv | Derive Radar Range Equation and give its significance<br>*Equation derivation 4 marks ,Significance 1 mark* | **5** |
| Q.3 | i | What is the concept of pattern multiplication?<br>*2 marks* | **2** |
| | ii | Describe in detail the effects of Uniform and Non-uniform Amplitude Distributions<br>*3 marks for each description and 2 marks for pattern of each .* | **8** |
| OR | iii | Write a note on operational details of scanning array and binomial array.<br>*2 marks for operational detail of each,(6 marks array factor, design ,HPBW ,Directivity etc)* | **8** |
| Q.4 | i | Write constructional details and characteristics of Yagi - Uda antenna. | **3** |
| | ii | State the design considerations for<br>monomial helical antennas in Axial Mode and Normal Modes. | **7** |
| OR | iii | Explain F/D Ratio, Aperture Blocking. Give the geometry and details Off-set Feeds, Cassegrain Feeds for parabolic reflector .<br>2,2.5 ,2.5(geometry required ) | **7** |
| Q.5 | i | Give the basic requirements of base station antenna and mobile station antenna.<br>*Base station 2 marks, mobile station 2 marks* | **4** |
| | ii | Describe the features of FHSS and CST tools | **6** |
| OR | iii | Write a short note on different types of horn antenna. 6 marks | **6** |
| Q.6 | | Attempt any two: | |
| | i | What is super refraction ? Explain the effect of earth's magnetic field on radio wave propagation.<br>*2+3* | **5** |
| | ii | Describe the structure of ionosphere mechanism of Ionospheric propagation<br>*Structure 3 marks ,details 2 marks* | **5** |
| | iii | Explain :Virtual height, Skip distance, Ionosphere abnormalities.<br>*Virtual height& Skip distance(3 marks ), Ionosphere abnormalities.(2 marks )* | **5** |