



304191

Seat No.	
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**T.E. (Electronics and Telecommunication) (Semester – II) Examination, 2014  
WAVE THEORY AND ANTENNAS  
(2008 Course)**

Time : 3 Hours

Max. Marks : 100

- Instructions :** 1) Answers to the **two** Sections should be written in **separate** answer books.  
2) Answer **any three** questions from **each** Section.  
3) **Neat** diagrams must be drawn **wherever** necessary.  
4) Figures to the **right** side indicate **full** marks.  
5) **Use** of calculator is **allowed**.  
6) Assume **suitable** data if **necessary**.

SECTION – I

1. a) What is polarization of wave ? Explain the polarization of three types of wave with the help of relevant diagram. 8  
b) What is pointing vector ? What is its significance ? Derive an expression for pointing vector. 8
- OR
2. a) Explain and derive the relationship between depth of penetration and conductivity. 8  
b) State Maxwell's field equation with their significance and derive the wave equation for lossless dielectric medium. 8
3. a) Write a short note on :  
i) Ionospheric abnormalities  
ii) Multi-hop Propagation. 8  
b) Calculate the skip distance for flat earth with MUF of 10 MHz. If wave is reflected from a height of 300 Km where maximum value of refractive index ( $n$ ) is 0.9. 8
- OR
4. a) Explain the effect of earth's magnetic field on ionospheric propagation. 6  
b) Derive the fundamental equation for free space propagation and explain its parameter. 5  
c) For flat earth surface explain the relationship between MUF and Skip distance. 5

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5. a) The power radiated by a lossless antenna is 10 watts. The radiation intensity of this antenna is  $U = B \cos^3 \theta$  (W/Sr)  $0 \leq \theta \leq \pi/2$   $0 \leq \Phi \leq 2\pi$ . Find : 9
- i) The maximum power density in (W/m<sup>2</sup>) at a distance of 1000 meter (assume for field distance) specify the angle where this occurs.
- ii) Directivity
- iii) Gain of the antenna
- b) Explain relationship between radian and steradian. 4
- c) Explain antenna radiation mechanism in detail. 5

OR

6. a) Explain the following parameters of antenna with relevant diagram and mathematical expressions. 9
- i) Radiation Pattern
- ii) Antenna Efficiency
- iii) Power Gain
- iv) Radiation Power Density.
- b) Write a short notes on : 9
- i) Antenna Radial Integrals
- ii) Effective length of transmitting antenna.

SECTION – II

7. a) Derive the expression for radiation resistance of small dipole. 8
- b) Find the radiation resistance of a double turn and 8-turn small circular loop. The radius of loop  $a = \lambda / 25$  and the medium is free space. 8

OR

8. a) An endfire array with element spaced at  $\lambda / 2$  and with axes of elements at right angles to the line of array is required to have directivity of 36. Determine the array length and the width of major lobe. 8
- b) Write a short notes on : 9
- i) Pattern Multiplication
- ii) Dolph-Tschebyscheff array.
9. a) Explain the effect of height and ground on antenna performance. 8
- b) What is meant by Rhombic Antenna ? How it is constructed ? Explain how unidirectional pattern is obtained in properly terminated Rhombic Antenna. 8

OR



10. a) Write a short notes on following antennas with respect to structural details, radiation pattern, features and applications. **16**
- i) Whip Antenna
  - ii) V Antenna
  - iii) Resonant Antenna
  - iv) Tower Radiator.

11. a) Explain the horn antenna, its different types and applications in detail. **9**
- b) What is Yagi-Uda antenna ? Explain its construction and properties with reference to directivity, bandwidth and principle of operation. **9**

OR

12. Write short notes on the following antennas. **18**
- i) Microstrip Patch Antenna
  - ii) Parabolic Reflector Antenna
  - iii) Super-turnstile Antenna
  - iv) Lens Antenna.

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