

**Question Paper Code : 57298**

**B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016**

**Sixth Semester**

**Electronics and Communication**

**EC 6602 – ANTENNA AND WAVE PROPAGATION**

**(Regulations 2013)**

**Time : Three Hours**

**Maximum : 100 Marks**

**Answer ALL questions.**

**PART – A (10 × 2 = 20 Marks)**

1. Define radiation resistance.
2. The radial component of the radiated power density of an antenna is given by  $W_{\text{rad}} = a_r W_r = a_r A_0 \sin \theta / r^2$  ( $\text{W}/\text{m}^2$ ), where  $A_0$  is the peak value of the power density,  $\theta$  is the usual spherical coordinate, and  $a_r$  is the radial unit vector. Determine the total radiated power.
3. Why antenna measurements are usually done in fraunhofer zone ?
4. The radiation resistance of an antenna is  $72 \Omega$  and the loss resistance is  $8 \Omega$ . What is the directivity (in dB), if the power gain is 15 ?
5. Define gain of an antenna. Bring out a relationship between gain and aperture of an antenna.
6. Draw the radiation pattern of an isotropic point sources of same amplitude and opposite phase that are  $\lambda/2$  apart along X-axis symmetric with respect to origin.

7. On what principle slot antenna works ? Explain the principle.
8. State Rumsey principle on frequency independence.
9. Find the range of LOS system when the receive and transmit antenna heights are 10m and 100 m respectively.
10. What are the specific features of troposcatter propagation ?

**PART – B (5 × 16 = 80 Marks)**

11. (a) Derive the expression for the field quantities radiated from a  $\lambda/2$  dipole and prove that the radiation resistance to be  $73 \Omega$ . (16)

**OR**

- (b) Derive the expression for the field quantities (E and H) for a small oscillation current element. (16)

12. (a) Discuss the geometry of a parabolic reflector and the significance of f/D ratio. Explain its feed configurations. (16)

**OR**

- (b) Discuss the construction and design of a yagi uda array. Show that the impedance of a folded dipole is  $300 \Omega$ . (16)

13. (a) Obtain the expression for the field and the radiation pattern produced by a N element array of infinitesimal with distance of Separation  $\lambda/2$  and currents of unequal magnitude and phase shift 180 degree. (16)

**OR**

- (b) (i) Using pattern multiplication determine the radiation pattern for 8 element array, separated by the distance  $\lambda/2$ . (8)
- (ii) Write short notes on tapered array and phased array. (8)

14. (a) (i) Explain the design procedure for the construction of log periodic antenna. (10)  
(ii) Discuss the construction equation for the helical antenna. (6)

**OR**

- (b) Explain the measurement procedure for the measurement of VSWR and radiation pattern. (16)
15. (a) (i) In the ionospheric propagation, consider that the reflection takes place at a height of 400 km and that the maximum density in the ionosphere corresponds to a refractive index of 10 MHz. Determine the ground range for which this frequency is the MUF. Take earth's curvature into consideration. (6)  
(ii) Describe the structure of the atmosphere and explain each layer in detail. (10)

**OR**

- (b) (i) Discuss the effects of earth's magnetic field on ionosphere radio wave propagation. (8)  
(ii) Describe the troposphere and explain how ducts can be used for microwave propagation. (8)