



- b) A 150 meter antenna transmitting at 1.2 MHz by ground wave has an antenna current of 8 Ampere. What voltage is received by the receiving antenna 40 Km away, with a height of 2m ? 6
- c) Explain the effect of earth's magnetic field on the propagation of radio waves in ionosphere. 6

OR

4. a) Explain the following in detail (**any two**) : 8
- a) Maximum Utilization Frequency (MUF)
 - b) Skip Distance
 - c) Virtual Height
- b) Explain critical frequency. A radio link has to be established between two earth stations placed at a distance of 25000 Km between them. If the height of the ionosphere is 200 Km and critical frequency is 5 MHz. Calculate the MUF for given path. Also calculate electron density in the ionosphere layer. 10
5. a) Define and explain the following radiation properties of antenna. 8
- a) Radiation Pattern
 - b) Radiation Intensity
 - c) Radiation Density
 - d) Effective Aperture
- b) Draw the flow diagram for E and H calculation with respect to current source J and H. Derive vector potential A for an electric current source J. 8

OR

6. a) What is polarization ? Explain i) Elliptical polarization ii) Linear polarization iii) Circular polarization. 8
- b) The radiation efficiency of a certain antenna is 95%. The radiation intensity is 0.5 W/Sr. Calculate the directivity of the antenna for following two case i) input power is 0.4 W and ii) radiated power is 0.3 W. 8

SECTION – II

7. a) Describe the principle of broadside array and end fire array. 8
- b) For an array of four isotropic sources along z-axis separated by a distance of $\lambda/2$ and a progressive phase shift $\alpha = 0$, find Null direction, Maxima direction, direction of side lobe maxima, HPBW and FNBW. 8

OR

8. a) Define Array factor. Explain any one of the following : 8
- 1) Binomial array
 - 2) Pattern Multiplication
- b) Explain with radiation characteristics N-element array with unequal magnitude and equal distance. 8



9. a) Write short note (**any 2**) : **8**
- i) Travelling wave antenna
 - ii) V antenna
 - iii) Effect of ground and antenna height
- b) List the different antennas used at low frequencies ? Explain any one with its working, construction and application. **8**

OR

10. Explain in detail the working of the following antennas. **16**
- i) Ferrite rod antenna
 - ii) Harmonic antenna
 - iii) Rhombic antenna
11. Explain the following antennas with respect to construction, design, working principle and various applications with frequency range. **18**
- i) Yagi-Uda antenna
 - ii) Folded dipole antenna
 - iii) Horn antenna

OR

12. Write a note on the following antennas with reference to structural design, working, advantages, disadvantages and applications. **18**
- i) Microstrip antenna
 - ii) Parabolic reflector antenna
 - iii) Helical antenna.