

Antenna & Wave Propagation

P. Pages : 2

Time : Three Hours



TKN/KS/16/7416

Max. Marks : 80

- Notes :
1. All questions carry marks as indicated.
 2. Solve Question 1 OR Questions No. 2.
 3. Solve Question 3 OR Questions No. 4.
 4. Solve Question 5 OR Questions No. 6.
 5. Solve Question 7 OR Questions No. 8.
 6. Solve Question 9 OR Questions No. 10.
 7. Solve Question 11 OR Questions No. 12.
 8. Due credit will be given to neatness and adequate dimensions.
 9. Assume suitable data whenever necessary.
 10. Illustrate your answers whenever necessary with the help of neat sketches.
 11. Use of non programmable calculator is permitted.
 12. Any other instructions use of smith chart is permitted.

1. a) Derive the voltage and current equation when the line is. 8
 - i) Open circuited at far end.
 - ii) Short circuited at far end.
 - b) A transmission line with a characteristic impedance of 200Ω is terminated in a purely resistance load, where $U_{\max} = 6 \text{ kv}$ and $V_{\min} = 3 \text{ kv}$. Calculate the load impedance. 6
- OR**
2. a) Write a short note on standing wave ratio (SWR) and derive the expression for SWR in terms of reflection coefficient. 8
 - b) A 100Ω transmission line, which is distortionless has the attenuation constant, 6
 $\alpha = 0.03 \text{ Np/m}$, phase velocity, $V_p = 0.9 \times 10^8 \text{ m/s}$ and a frequency of 1 GHz. Calculate the line parameter R, L, C and G. The same transmission line has $Z_0 = 50 \Omega$, $Z_L = 150 + j 150 \Omega$ find out SWR and show calculated value of SWR on smith chart.
3. a) Draw the charge and current distribution for a Hertzian dipole and explain how they contribute for radiations. 7
 - b) Calculate the radiation resistance of an infinitesimal dipole of length $\lambda/50$ in free space. 6
- OR**
4. a) Write a short note on **any three**. 13
 - i) Radiation field from loop Antenna.
 - ii) Radiation resistance of short dipole.
 - iii) Different field zones.
 - iv) Linear wire antenna's.
5. a) Derive the complete expressions for array of n isotropic sources of equal Amplitude and spacing for Broadside case. 7
 - b) Define pattern multiplication in brief. 6

OR

6. a) Explain the principle of operation of Yagi-Uda array antenna with neat schematic diagram. **7**
- b) Design a five element broad side array. Which has the optimum pattern for a side lobe level of 20dB. the spacing between element has to be $\lambda/2$. **6**
7. a) Explain the different feeding methods associated with microstrip antenna. **7**
- b) Design a rectangular microstrip antenna using a substrate (FR₄) with dielectric constant of 4.4, h = 1.6mm and tan d = 0.002 so as to resonate at 2 GHz. **6**
- OR**
8. Write a short note on **any three**. **13**
- i) Methods of analysis of microstrip antenna.
- ii) Fringing effects of microstrip antenna.
- iii) Transmission line model of microstrip antenna.
- iv) Applications of microstrip antenna.
9. a) What are the different types of Horn antenna? Discuss the salient features of horn antenna. **7**
- b) The aperture dimension of a pyramidal horn are 12 x 6cm. It is operating at a frequency of 6 GHz. Find the beam width, power gain and directivity. **6**
- OR**
10. Write a short notes on **any three**. **13**
- i) Aperture Antenna Applications.
- ii) Corner reflector.
- iii) Reciprocity theorem.
- iv) Cassegrain feed.
11. a) Describe the space wave propagation and explain the principle of communication by troposcatter. **8**
- b) Discuss the various sources of errors in antenna measurement. **6**
- OR**
12. Write a short notes on **any two**. **14**
- i) Radiation pattern measurement.
- ii) Maximum usable Frequency (MUF).
- iii) Noise and Interference in radio wave propagation.
