

B.E. (Electronics Telecommunication /
Electronics Communication Engineering) Semester Fifth (C.B.S.)
Antenna and Wave Propagation

P. Pages : 2

Time : Three Hours



KNT/KW/16/7328

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 wherever necessary.
 10. Illustrate your answers wherever necessary with the help of neat sketches.
 11. Use of non programmable calculator is permitted.

1. a) A transmission line of length 0.4λ has a characteristics impedance of 100Ω and is terminated in a load impedance of $200 + j180\Omega$. 6

Find the :

i) Input Impedance of line

ii) VSWR

(Use Smith Chart)

- b) Explain in detail about Standing Wave Ratio (SWR) & derive the expression for SWR in terms of Reflection Coefficient. 8

OR

2. a) Calculate S.W.R. & reflection co-efficient on a line having $Z_0 = 300\Omega$ & terminated in $Z_R = 300 + j400\Omega$. Show that calculated value of reflection co-efficient & S.W.R. on Smith Chart. 6

- b) Derive the expression for the Input impedance of Transmission Line, & show that 8

$$Z_{s/c} = Z_{o/c} \tan^2 h (r\ell)$$

where $Z_{s/c}$ = short ckt Impedance

$Z_{o/c}$ = open ckt Impedance

3. a) Prove that the field of Infinitesimal dipole antenna consists of three terms involving $\frac{1}{r}$, $\frac{1}{r^2}$ & $\frac{1}{r^3}$. Also show that Radiation Resistance of an antenna in free space is. 8

$$R_{\text{rad}} = 80\pi^2 \left(\frac{dL}{\lambda} \right)^2, \text{ where } dL = \text{length of antenna.}$$

- b) Compute the radiation resistance, the power radiated & efficiency of an antenna having total resistance of 50Ω , an effective height of 60 meters & a current of 50A (r.m.s.) at 0.480 MHz. 5

OR

4. a) A Loop direction finder has a square loop aerial of 1m width & 40 turns. The loop is connected to a receiver tuned to 1MHz. Calculate the voltage induced by a plane wave. If the field strength is $10\mu\text{v/m}$ & the loop is oriented at 60° from the direction of the transmitter. 5

- b) Write a short notes on **any three**. 8
- i) Loop antenna ii) Half wave length dipole antenna
 iii) Folded dipole antenna iv) Hertzian dipole antenna
5. a) Define principle of pattern multiplication. What is the radiation pattern obtained because of 4 isotropic radiators having separation between two consecutive radiators $d = \lambda/2$ & progressive phase shift in radiator current is zero. 6
- b) Design a five element broadside array which has the optimum pattern for a side lobe level of 20db. The spacing between element has to be $\lambda/2$. 7
- OR**
6. a) A broadside array with 8 elements having spacing between them is $\lambda/2$. Find the directions of nulls, maxima & half power beam width, sketch the radiation pattern of array. 7
- b) Write short notes on **any one**. 6
- i) Yagi - uda Antenna ii) Log - Periodic Antenna
7. a) Explain the different feeding methods of Microstrip patch Antenna & also compare them. 8
- b) Explain in details Transmission Line model of microstrip antenna. 5
- OR**
8. a) Design a circular microstrip antenna using a substrate (RT/duroid 5880) with a dielectric constant of 2.2, $h = 0.1588$ cm so as to resonate at 10GHz. 6
- b) Explain in detail construction of microstrip antenna. Also state the advantages of microstrip antenna over conventional antenna. 7
9. a) Explain dual shaped Reflector system in details. 7
- b) Write short notes on. 7
- i) Corner reflector antenna & its application.
 ii) Plane reflector.
- OR**
10. a) The aperture dimensions of a pyramidal horn antenna 16 x 8 cm. If it is operating at a frequency of 6 GHz. Find the beam width, power gain & directivity. 6
- b) Explain the different types of Horn Antenna & give its Gain expression. Also state the different application of it. 8
11. a) Explain in details ground wave propagation. 7
- b) What are the different types of antenna measurement ranges are there. Explain any one. 6
- OR**
12. a) State & Explain Reciprocity principle in antenna measurement. 6
- b) State the different methods of measurements of Gain of an antenna. Explain any one in detail. 7
