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06TE64

Sixth Semester B.E. Degree Examination, May/June 2010
Transmission Lines and Antennas

Time: 3 hrs.

Max. Marks:100

Note: ***1. Answer any FIVE full questions, selecting at least TWO questions from each part.***
2. Smith chart usage is permitted.
3. Standard notations are used.

PART – A

1 a. Formulate the differential equations of uniform general transmission lines from fundamentals and find their general solutions in terms of voltage (E) and current (I) in exponential format at any point on the lines. **(10 Marks)**

b. The values of the primary constants of an open – wire line per loop kilometer are R = 10 Ω, L = 3.5 mH C = 0.008 μF and G = 0.75 μ mho. For signal frequency of 1000 Hz, calculate the characteristic impedance Z_o, phase constant γ, attenuation constant α, phase shift constant β, wavelength λ and phase velocity v_p. **(10 Marks)**

2 a. Show that the input impedance of OC and SC loss-less transmission lines are purely reactive, sketch their reactance curves and explain. **(10 Marks)**

b. A transmission line having characteristic impedance of 50 ohms is terminated by a load impedance of 100 – j75 ohms. Find out the standing wave ratio (S) and the reflection coefficient (K) of the line with the help of the smith chart and verify the result by numerical method using equations. **(10 Marks)**

3 a. Derive an expression for the location 'd' and length '*l*' of the single stub so as to effect matching on a transmission line. **(10 Marks)**

b. A line of Ro = 400 Ω is connected to a load of 200 + j300 Ω which is excited by a matched generator at 800 MHz. Find the location and length of a single stub nearest to the load to produce an impedance match, using Smith chart. **(10 Marks)**

4 a. Explain the following terms as related to antenna systems :
   i) Radiation intensity
   ii) Directivity
   iii) Beam area
   iv) Half Power Beam Width (HPBW)
   v) Beam efficiency. **(10 Marks)**

b. Define aperture of an antenna. Explain five different types of apertures of antenna. Derive equations for each of them and bring out the relation among them. **(10 Marks)**

PART – B

5 a. Derive an expression and draw the field pattern for an array of two isotropic point sources with equal amplitude and opposite phase and with physical separation of λ/2 on the array axis. **(10 Marks)**

b. What is an isotropic point source? A linear uniform array of four isotropic antennas placed in a horizontal axis, producing broad side array, satisfy the following parameters :
No. of sources in the array $n = 4$.
Phase difference between adjacent sources $\delta = 0$.
Distance between adjacent sources $d = \lambda/2$. Obtain and draw the field pattern and calculate BWFN and HPBW. **(10 Marks)**

6 a. Derive an expression for radiation resistance of a short dipole with uniform current. **(08 Marks)**

b. Calculate the radiation resistances of short dipole of lengths i) $L = \lambda/10$ and ii) $L = \lambda/100$. **(04 Marks)**

c. Derive the far – field expressions for a small loop antenna. **(08 Marks)**

7 a. Explain with examples the different types of rectangular and circular horn antennas. What are their advantages over the other antennas? Derive the design equation for the flare angle of horn antenna. Mention any one application. **(10 Marks)**

b. What is a log – periodic antenna? Why is it called so? Explain its characteristics and applications, with a suitable diagram. **(10 Marks)**

8 Write short notes on the following :

a. Parabolic reflectors
b. Slot antennas
c. Lens antennas
d. Ultra – Wide Band (UWB) antennas. **(20 Marks)**

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