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06TE64

Sixth Semester B.E. Degree Examination, June–July 2009
Transmission Lines and Antennas

Time: 3 hrs. Max. Marks:100

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

PART - A

1 a. Obtain the required condition for a transmission line to have neither frequency nor delay distortion. **(10 Marks)**

b. A generator of 1-0 volt, 1kHz supplies power to 100 km open wire line terminated in Z_0 and having following parameters.
R = 10.4 ohms / km ; L = 0.00367 henry per km ; G = 0.8×10^{-6} mhos per km
C = 0.00835 μF per km.
Find, characteristic impedance, Propagation constant, wavelength of the propagating wave, sending end current. **(10 Marks)**

2 a. Comment with Justification on the correctness of the statement – "Standard reference antenna for the directive gain is the istropic antenna". **(05 Marks)**

b. Comment with justification on the correctness of the statement – "A quarter wave section of the line may be thought of as a transformer to match a load and to a source impedance". **(05 Marks)**

c. A line of characteristic impedance 200 ohms is terminated in a load of 80 – J100 ohms. Determine the location and length of the single stub matching section. The characteristic impedance of stub is same as that of line. **(10 Marks)**

3 a. Derive Frii's Transmission formula. **(10 Marks)**

b. Define Stray factor, Effective length, Effective Aperture. State the expressions, notations used. **(10 Marks)**

4 Write short notes on :

a. T and π equivalent to lines. **(07 Marks)**

b. Telephone cables. **(07 Marks)**

c. Antenna Field Zones. **(06 Marks)**

PART - B

5 a. Find the directivity for the source with unidirectional cosine squared power pattern. **(05 Marks)**

b. Illustrate the principles of pattern multiplication. **(05 Marks)**

c. Derive the expression for an N-element uniform array. Further show that the peaks of this array factor are given by the solution of the equation.
N.tan(ψ/2) = tan (N ψ/2). **(10 Marks)**

6 a. Derive the expressions for Electric and magnetic fields of a short dipole. **(10 Marks)**

b. Give the properties of Horn Antenna. **(05 Marks)**

c. Illustrate – Babinet's Principle. **(05 Marks)**

7 a. Derive instantenons electric field at a large distance 'r' from a loop antenna of radius 'a'. **(10 Marks)**

b. Give the properties of Parabolic reflector. How a parabolic reflector servers the purpose of transmitting and receiving antenna? Discuss in detail its short comings. **(10 Marks)**

Write short notes on :

a. Broad side array with non uniform amplitude distribution. **(07 Marks)**

b. Lens antenna. **(07 Marks)**

c. Plasma antenna. **(06 Marks)**

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Sixth Semester B.E. Degree Examination, Dec.09/Jan.10
Transmission Lines and Antennas

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Derive the expressions for cut-off frequency and characteristic impedance of constant-K low pass filter-T section. **(10 Marks)**

b. Derive the expression for velocity of propagation in case of ordinary telephone cables. **(05 Marks)**

c. Draw the standing waves diagram on a line having open-or-short circuit termination and define nodes. **(05 Marks)**

2 a. Derive the necessary condition for distortionless line. **(10 Marks)**

b. Why must impedance (or admittances) be normalized before being plotted on a standard Smith chart? **(05 Marks)**

c. Why are short circuit stub preferred to open circuited ones? **(05 Marks)**

3 a. Explain the following terms as related to antennas :
i) Beam width ii) Band width iii) Gain **(12 Marks)**

b. Prove that beam efficiency plus stray factor is equal to unity. **(04 Marks)**

c. Find the power density at a distance 3 km from an isotropic source, if the power density at a distance 2 km is 10m watts/ sq.units. **(04 Marks)**

4 Write notes on :
a. Antenna field zones b. Quarter wave line c. Reflection loss **(08+06+06 Marks)**

PART – B

5 a. Derive the total field expression in case of two isotropic sources are with same amplitude and opposite phase. Plot the relative field pattern when these two isotropic sources are spaced by $\frac{\lambda}{2}$ apart. **(10 Marks)**

b. Find the directivity for the source with radiation intensity variation $U = U_m \sin\theta \sin^2\phi$ where θ and ϕ range between 0 and π. **(05 Marks)**

c. Illustrate the principle of pattern multiplication with suitable example. **(05 Marks)**

6 a. Derive the expressions for instantaneous electric and magnetic field at a large distance 'r' from a loop antenna of radius 'a'. **(10 Marks)**

b. A half wave dipole radiating in free space is driven by a current of 0.5 amps at the terminals. Calculate the electric field strength 'E' at a distance 1 km from the antenna at angles 45° and 90°. **(05 Marks)**

c. Using the relevant equations, justify : "A helical antenna can be used as polarization diversity system". **(05 Marks)**

7 a. Describe design considerations of log-periodic array. **(09 Marks)**

b. A 64-mt diameter dish antenna operating at a frequency of 1.43 GHz is fed by a non-directional antenna. Calculate its :
i) HPBW ii) BWFN iii) Gain with respect to $\frac{\lambda}{2}$ dipole with even illumination. **(06 Marks)**

c. Illustrate working principles of non-metallic dielectric lens antenna. **(05 Marks)**

8 Write short notes on : **(08+06+06 Marks)**
a. Ultra wide band antennas b. Patch antenna c. Embedded antenna.

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