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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)

Sixth Semester, B.E. – Electronics and Communication Engineering

Semester End Examination; June - 2016

Antennas and Wave Propagation

Time: 3 hrs *Max. Marks: 100*

***Note**: Answer **FIVE** full questions, selecting **ONE** full question from each unit.*

UNIT - I

1 a. Define the following terms with respect to antenna: 9

i) Antenna directivity ii) Effective aperture (iii) Beam solid angle.

b. Find the power received by an antenna kept at a distance of 100 km by a transmitting antenna at 3 MHz gain 40 and transmitting power 1000 kW. Assume gain of receiving antenna is 15. 5

c. Find the total power radiated and directivity for the following sources : 6

i) Point source with Cosine Power Pattern

ii) Point source with Sine Squared Power Pattern.

2 a. Show that maximum effective aperture of a linear $\lambda/2$ dipole is 0.13 λ^2. Also find its directivity. 6

b. State power theorem and verify it for isotropic source prove that the directivity for a source with a unidirectional power pattern is given by $U = U_m \cos^n\theta$ can be expressed as $D_n = 2(n+1)$. 'U' has a value for $0 \le \theta \le \pi/2$ and $0 \le \phi \le 2\pi$. 10

c. Write note on shape impedance consideration. 4

UNIT - II

3 a. Obtain field equation and field pattern in the far field region due to array of two isotropic point sources, 10

(i) with same amplitude and phase (ii) with same amplitude and opposite phase.

Assume $d = \lambda/2$.

b. Explain the concept of principle of pattern multiplication. 5

c. For an array of two identical point source separated by a distance of $\lambda/2$ with $\delta = 0$ and having field variation given by $E_0 = E_0' \sin\theta$ write the resultant field equation and draw the field pattern using principle of pattern multiplication. 5

4 a. Derive an expression for resultant field intensity of an array of N – isotropic sources. 6

b. Show that the width of the principle lobe of an end – fire array is greater than that of broad side array of the same spacing between the sources derive the equation and justify with example. 8

Contd….2

c. Define following types of n element board side array :
i) Uniform ii) Edge iii) Binomial. 6

UNIT - III

5 a. Derive the field equations for E_r, E_θ and H_ϕ of a short dipole for general case. 10

b. Explain the working and advantages of folded dipole antenna. 6

c. A thin linear dipole antenna is $\lambda/12$ long. If its loss resistance is 1.2 Ω find the radiation resistance and its efficiency. 4

6 a. Derive the far field equations for small loop antenna and compare these field equations with the far field equations of short dipole. 10

b. Explain the working of slot and complementary antennas. 6

c. The radius of a circular loop antenna is 0.02 λ how many turns of this antenna will give a radiation resistance of 35 Ω. 4

UNIT - IV

7 a. Explain different types horn antenna obtain the design equation for rectangular horn length L and path length difference δ. 10

b. Obtain in db the directivity of 20 turn helix having pitch angle ∝ equal to 12°. Circumference equal to one wavelength. 4

c. Explain the working and application of log periodic antennas. 6

8 a. Explain the working and application of corner reflector. 6

b. Explain the mobile station antennas for terrestrial mobile communication. 5

c. Write a note on : (i) Embedded antenna (ii) Plasma antenna (iii) Ultra wideband antenna. 9

UNIT - V

9 a. Discuss the surface wave propagation and dependence of ground attenuation factor with numerical distance. 7

b. Explain the sub refraction, super refraction and duct propagation in tropospheric wave propagation. 7

c. Explain the wave propagation by means of tropospheric scattering. 6

10 a. Derive the equation for relative permittivity and conductivity of ionosphere. 8

b. Define the following parameters :
(i) Critical frequency (ii) Skip distance (iii) Maximum usable frequency 8
Obtain the relation for D skip in terms of f_c and $f_{Muf.}$

c. Calculate the electron density required to return a signal at 10 MHz incident on the bottom of layer at an angle of 26° to the normal. 4

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