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B.TECH.
(SEM V) THEORY EXAMINATION 2018-19
ANTENNA AND WAVE PROPAGATION

Time: 3 Hours ***Total Marks: 70***

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. 2 x 7 = 14

a) Give reason why does retardation potential take place?
b) A thin dipole antenna is 1/15 long if its loss resistance is 1.5 W. Find radiation resistance and efficiency?
c) What is end-fire array and broad-side array?
d) Define the gain of antenna?
e) Define virtual height and skip distance?
f) Estimate the distance & effective aperture of a paraboloid reflector antenna required to produce Null beam width of 10^0 at 3GHz.
g) Find the radiation efficiency of a 1m diameter loop of 10mm diameter copper wire at 10MHz.

SECTION B

2. Attempt any *three* of the following: 7 x 3 = 21

a) Calculate the effective aperture for a dipole antenna of length 2cm at a 1.2 GHz. What will be the power received for an incident power density of $2mW/m^2$.
b) Sketch the horizontal and vertical plane radiation pattern of Centre fed vertical dipole for the following length- (i) λ/2 dipole (ii) 3λ/2 dipole (iii) 2λ dipole
c) What is folded dipole antenna? Describe Yagi-Uda antenna and explain its operation?
d) Explain the principle of operation of parabolic dish? Why is the parabolic shape is used?
e) Explain the phenomenon of Duct Propogation. What are the ionospheric conditions under which duct propagation can take place?

SECTION C

3. Attempt any *one* part of the following: 7 x 1 = 7

a) Discuss about antenna impedance and antenna temperature?
b) How the directivity of any antenna is defined and what is the relationship between directivity and gain of the antenna?

4. Attempt any *one* part of the following: 7 x 1 = 7

a) Explain the principle of pattern multiplication. Obtain the radiation pattern of 4 element fed in-phase, spaced λ/2 apart using pattern multiplication.
b) Define the isotropic sources? N-isotropic sources are arranged in a uniform linear array. Derive an expression for the array factor?

5. Attempt any *one* part of the following: 7 x 1 = 7

a) A linear broad-side array consists of four equal isotropic in-phase point source width λ/2 spacing. Find the directivity, BWFN and HPBW of the array?
b) An end fire array consisting of several half wavelength isotropic radiators has a directive gain of 30. Find the array length and width of the major lobe. What will be the value for broadside array?

6. Attempt any *one* part of the following: 7 x 1 = 7

a) Explain with suitable diagram log periodic antenna? What are practical application of these antenna?

b) A loop antenna consists of 10 turns, each having an area of 1 m^2. A radio wave having a frequency of 1 MHz induces a sinusoidal emf of 100 mV(rms) in this antenna when it is oriented for maximum response. Calculate the peak value of the magnetic field intensity of the RF wave. ($\mu_0=4\pi x10^{-7}$h/m)

7. Attempt any *one* part of the following: 7 x 1 = 7

a) Assume that reflection take place at a height of 350km & that the maximum density in the ionosphere corresponds to a 0.8 refractive index at 15 MHz what will be range for which the MUF is 20MHz. Assume flat Earth.

b) Derive expression for refractive index of ionosphere $\mu = \sqrt{1-\frac{81N}{f^2}}$.