

**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  $1.5 \Omega$ . 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  $10^\circ$  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  $2 \text{ mW/m}^2$ .
- b) Sketch the horizontal and vertical plane radiation pattern of Centre fed vertical dipole for the following length- (i)  $\lambda/2$  dipole (ii)  $3\lambda/2$  dipole (iii)  $2\lambda$  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 Propagation. 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  $\lambda/2$  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 with  $\lambda/2$  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  $1 \text{ m}^2$ . 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. ( $\mu_0 = 4\pi \times 10^{-7} \text{ H/m}$ )

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  $\mu = \sqrt{1 - \frac{81N}{f^2}}$ .

RAJESH KUMAR TEWARI

11-Dec-2018 13:34:08 | 117.55.243.94