

Printed Pages: 2

Paper Id: 130501

Sub Code: REC 051

Roll No. 

--	--	--	--	--	--	--	--	--	--

**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  $1.5 \text{ W}$ . 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  $10^\circ$  at  $3 \text{ GHz}$ .
  - g) Find the radiation efficiency of a  $1 \text{ m}$  diameter loop of  $10 \text{ mm}$  diameter copper wire at  $10 \text{ MHz}$ .

**SECTION B**

2. Attempt any three of the following: 7 x 3 = 21
- a) Calculate the effective aperture for a dipole antenna of length  $2 \text{ cm}$  at a  $1.2 \text{ GHz}$ . 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)  $1/2$  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 width  $\lambda/2$  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?

1 | Page

MANISH KUMAR JHA | 11-Dec-2018 13:29:55 | 117.55.242.131

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

MANISH KUMAR JHA

/ 11-Dec-2018 13:29:55 | 117.55.242.131