

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular), November-December 2014

B. Tech in Electronics and Communication Engineering, Semester VII

Roll No.....

Antenna and Wave Propagation ECE 701

Time: 3 hours

Max. Marks: 100

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.

Q.1A Objective type multiple choice questions (10 questions @ 1 mark)

10

- I. The testing antenna is preferred to use in receiving mode because
 - (a) It receives plane wave of uniform plane and phase
 - (b) It receives plane wave of properly polarized
 - (c) It receives maximum power
 - (d) none of the above
- II. Which of the following does not belong to the free-space range
 - (a) elevated range
 - (b) Slant range
 - (c) compact range
 - (d) anechoic chamber
 - (e) none of these
- III. The half wave dipole antenna and pyramidal horn antenna are universally used as standard gain antenna in the measurement, because they
 - (a) both possess linear polarization
 - (b) very directive antennas
 - (c) isolated from environmental conditions
 - (d) all of the above
- IV. In the antenna measurement, primary polarization is also known as
 - (a) desired polarization
 - (b) undesired polarization
 - (c) cross polarization
 - (d) none of these
- V. It describes the noise power received by the antenna at a particular frequency and product of the antenna directivity and the brightness temperature
 - (a) antenna noise temperature
 - (b) noise figure
 - (c) Boltzmann coefficient
 - (d) none of these
- VI. The directivity of pyramidal/conical horn antennas is The E-plane/H-plane horn antenna
 - (a) More than
 - (b) Less than
 - (c) Equal to
 - (d) None of these
- VII. Which of these is true for a parabolic reflector antenna?
 - (a) High gain and high beam width
 - (b) High gain and low beam width
 - (c) Low directivity and circularly polarized
 - (d) None of these
- VIII. A loop antenna is preferred for use as receiving antenna rather than the transmitting one because
 - (a) High efficiency
 - (b) High gain
 - (c) low efficiency
 - (d) none of these

- IX. Directivity of Antenna is determined by
 (a) Gain (c) Radiation Pattern
 (b) Impedance pattern (d) efficiency
- X. Folded dipole antenna function at
 (a) Only at odd harmonics (c) both of these
 (b) Only at even harmonics (d) None of these

Q.2 Short answer type questions (4 questions @ 2.5 marks) 10

- I. Front to back ratio
 II. Reciprocity theorem
 III. Binomial array
 IV. Antenna efficiency

Q.3A How the directivity of an antenna defined and what is the relation between directivity and gain of an antenna. 05

Q.3B An antenna has a radiation resistance of 72 ohm, a loss resistance of 8 ohms and a power gain of 12 dB, determine the antenna efficiency? 05

Q.4A Obtain expression of (i) Direction of pattern maxima (ii) direction of pattern minima, for end fire array consisting of n isotropic sources of equal amplitude and spacing. 05

Q.4B Take a typical case for $n=4$, $d = \lambda/2$ and $\alpha = 0^\circ$ (end fire array) . plot the field pattern with all components. 05

Q.5A A parabolic reflector have a power gain of 1000 at $\lambda = 10$ cm and is fed by a non directional antenna. Estimate its beamwidth between half power point (HPBW) and between first null (BWFN) w.r.t half wave dipole. Assume even illumination. 05

Q.5B Find out the beamwidth between first nulls and power of a 2 m paraboloid reflector operating at 6000 MHz. 05

Q.6A How the field pattern of receiving antenna experimentally found? Give a block diagram and explain. 05

Q.6B Find the terminal resistance of complementary slot for a cylindrical dipole antenna with length to diameter ratio of 28 and length of 0.925λ having terminal impedance of $(710 + j.0) \Omega$. 05

OR

Q.6B A cylindrical antenna with a length to diameter ratio of 100 is resonant when the length is about 0.475λ . The terminal impedance is resistance and equal to about 67Ω . Find out the dimensions and terminal impedance of the complementary slot antenna of 10 cms wavelength. 05

Q.7A Describe the methods of measuring the gain of an antenna. 05

Q.7B What do mean by tilting of wave and tilt angle/ how does tilt angle affect the field strength received at a finite distance from the transmitter. 05

OR

- Q.7B Define ground wave attenuation. Show that attenuation factor A is function of frequency and earth constant. 05
- Q.8 Describe how critical frequencies for ionospheric propagation are measured. Explain how the wave propagation of a down coming wave after reflection from the ionosphere changes and how does it affect reception. 10
- Q.9A Calculate the gain of an antenna with a circular aperture of diameter 3 meters at a frequency of 5 GHz and Calculate the maximum effective aperture of a microwave antenna which has a directivity Of 900. 10
- Q.9B 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 e.m.f. of $100 \mu\text{V}$ (r.m.s.) in this antenna when it is oriented for maximum response. Calculate the peak value of the magnetic field intensity H of the radio wave ($\mu_0 = 4 \pi \times 10^{-7} \text{ henry/m}$) 10
- OR
- Q.9B A loop of 10 turns and area 1 m^2 lies in a plane making an angle 30° with the direction of propagation of an incoming signal of frequency 150 kHz. What is the field strength of the signal If the *emf* induced in the loop is 1.5 mV? 10