

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Backlog), April-May 2016

M. Tech in Electronics and Communication Engineering, Semester III

Roll No.....

Antenna Theory and Technique MTEC421

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. Optimum working frequency may be calculated by
(a) 1.5 MUF (b) 0.85 MUF (c) 2.5 MUF (d) none of these
- II. The highest frequency that can be reflected by the ionosphere is one which has $\mu=0$
(a) f_c (b) MUF (c) OWF (d) none of these
- III. TV broadcasting takes place along the
(a) surface to earth (b) Duct zone (c) Troposphere zone
(d) 10 km from the earth
- IV. Which of the following feed technique offer longer bandwidth
(a) coaxial feed (b) aperture coupled feed (c) proximity coupled feed
(d) microstrip line feed
- V. Narrow bandwidth of patch antenna is useful particularly in
(a) wireless communication (b) government security
(c) medical application (d) none of these
- VI. Input impedance of the antenna is constant over a wide range of frequency
(a) Yagi antenna (b) Helical antenna (c) Patch antenna
(d) none of these
- VII. Gain of a helical antenna is
(a) Directly proportional to HPBW (b) inversely proportional to HPBW
(c) independent from HPBW (d) none of these
- VIII. The region existing close to the mouth of Horn antenna is
(a) Far-field region (b) Near-field region
(c) Quasi-static region (d) Electrostatic region
- IX. One of the very useful multi-band HF receiving antennas is
(a) Dipole antenna (b) Log periodic antenna
(c) Rhombic antenna (d) Helix antenna
- X. The three element Yagi-Uda antenna also known as
(a) Radiation antenna (b) Phase antenna
(c) Directivity antenna (d) Beam antenna



Q.2	Short answer type questions (4 questions @ 2.5 marks)	10
I.	Front to back ratio	
II.	Binomial array	
III.	Reciprocity theorem	
IV.	Antenna efficiency	
Q.3A	A signal of RMS amplitude of 10V is applied to the input terminals as of a half wave dipole. Calculate the radiated power, if the dipole has input impedance of $Z_n = 73 + j42 \Omega$.	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	Find out the beamwidth between first nulls and power of a 2 m paraboloid reflector operating at 6000 MHz.	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	The power delivered to an isotropic radiator is 1 kW and the antenna efficiency is 90%. Find the electric field intensity at a distance of 100km.	05
Q.5B	What is current required to radiate power of 20 W from a loop antenna of circumference $\lambda/5$.	05
Q.6A	How the field pattern of receiving antenna experimentally found? Give a block diagram and explain.	05
Q.6B	Define ground wave attenuation. Show that attenuation factor A is function of frequency and earth constant.	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	How the directivity of an antenna defined and what is the relation between directivity and gain of an antenna.	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	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 <i>emf</i> induced in the loop is 1.5 mV?	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 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

