Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
Manipal University

FIFTH SEMESTER B.TECH (E & C) DEGREE END SEMESTER EXAMINATION
NOV/DEC 2015
SUBJECT: ANTENNAS (ECE 307)

TIME: 3 HOURS **MAX. MARKS: 50**

Instructions to candidates
- Answer **ANY FIVE** full questions.
- Missing data may be suitably assumed.

1A. The normalized radiation intensity of a given antenna is given by, $U = sin^2(\theta)sin^3(\emptyset)$.
The intensity exists only in the $0 \leq \theta \leq \pi$ and $0 \leq \emptyset \leq \pi$ region and zero elsewere.
a) Find the exact directivity.
b) HPBW in azimuthal and elevation planes.

1B. Give the current distribution plot for a linear dipole antenna with l=3λ/2 at different instants of time. Clearly indicate the polarity of current on the dipole.

1C. Explain the working of Micro-strip Antenna with neat diagrams.

(5+3+2)

2A. A λ/2 dipole, with a total loss resistance of 1 Ω, is connected to a generator whose internal impedance is 50 + j25 Ω. Assuming the peak voltage of the generator is 2V and the impedance of the dipole, excluding the loss resistance, is 73 + j42.5 Ω, find the power
(a) radiated by the antenna
(b) dissipated in the antenna
(c) supplied by the source.

2B. Explain the radiation mechanism in a two wire transmission line system.

2C. Define a)Directivity b)Radiation Intensity

(5+3+2)

3A. Derive an expression for the vector wave equation due to a magnetic current source. Also write the expression for the magnetic field H due an electric current source using duality theorem.

3B. A λ/2 dipole is placed at the origin radiates an average power of 600W at frequency of 300MHz. An infinitesimal dipole is placed in free space with its centre at a point P(200m, 90^0, 70^0) is used as receiving antenna. Assuming lossless case,
a) find the available power at terminals of receiving antenna.
b) What will be the received power if receiving antenna is placed at P(200m, 0^0, 70^0)?

3C. Find the radiation resistance of a single turn and 8 turns small circular loop of radius 0.2λ operating at 150MHz with a ferrite core having relative effective permeability of 640.

(5+3+2)

4A. Starting from fundamentals, derive the expression for the E field and H fields of a linear dipole with length l such that $\lambda/50 < l < \lambda/10$.

4B. Design a broadside Dolph-Tschebyscheff array of 5 elements with spacing "d" between the elements

and with major-to-minor lobe ratio of 20 dB. Find the excitation coefficients, nulls at $d = \lambda/2$ and form the array factor.

4C. Find the radiation resistance of a dipole whose overall length is $l = \lambda/100$.

(5+3+2)

5A. Derive an expression for the normalized Array Factor for N-element linear array with uniform amplitude and spacing having centre element as reference point. Also write expressions corresponding to the nulls and maximum values of the array factor.

5B. A vertical infinitesimal linear dipole is placed at a distance $h=3\lambda/2$ above an infinite perfectly conducting flat ground plane. Determine the angles (in degrees from vertical) where the maximum of the total field will occur.

5C. If an antenna has a field pattern of $U = sin^2(3\theta)$, find the HPBW and FNBW.

(5+3+2)

6A. Derive the expression for the vector potential **A** due a small circular loop placed symmetrically about origin.

6B. A Binomial array of 6 isotropic elements has spacing $d = \lambda/2$. Find (a) HPBW (b) Directivity (c) Co-efficient of the Pascal Triangle

6C. Explain the working principle of Yagi-Uda antenna.

(5+3+2)