Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
Manipal University

FOURTH SEMESTER B.Tech. (E & C) DEGREE END SEMESTER EXAMINATION - April/May 2017
SUBJECT: ANTENNAS (ECE - 2201)

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

Instructions to candidates
- Answer **ALL** questions.
- Missing data may be suitably assumed.

1A.	Design a Dolph-Tschebyscheff array of 3 elements with spacing d=0.75λ having major to minor lobe ratio of 25 dB. Find the excitation coefficients, array factor and angle of null.
1B.	For an End fire array with 3 elements having uniform amplitude and spacing with d = $\lambda/2$ calculate a)Angle of first null b)Angle of maxima c) HPBW
1C.	Write a short note BALUN
	(5+3+2)
2A.	The normalized radiation intensity of an antenna is given by U = $\sin^2(\theta)\sin^2(\phi)$.The intensity exists only in the region ($0 \le \theta \le 180^0$) and ($0 \le \phi \le 180^0$) and is zero elsewhere. Find the a) exact directivity b) approximate directivity (using Kraus' & Tai and Pereira' formula)
2B.	Show that maximum directivity of a circular loop of radius < $\lambda/10$ is 1.5 in the far field
2C.	Write an explanatory note on Yagi Uda antenna
	(5+3+2)
3A.	Starting from far zone E&H, derive an expression for P_{rad} and D_0 of an infinitesimal electric dipole.
3B.	Derive an expression for effective Max aperture of an antenna in terms of terms of its max directivity
3C.	Calculate the R_r of a 2 turn small circular loop of radius λ with a ferrite core having effective relative permeability of 300.
	(5+3+2)
4A.	Derive the expression for the Vector potential ***A*** for a current source ***J*** .Also write the solution for the vector wave equation.
4B.	Write short notes on Huygen's and Babinet's principle.
4C.	Give the dual of following relations. $\nabla \times \mathbf{H}_A = \mathbf{J} + j\omega\epsilon\mathbf{E}_A \qquad \nabla \times \mathbf{E}_A = -j\omega\mu\mathbf{H}_A$
	(5+3+2)
5A.	A half-wave dipole is radiating in free space. The co-ordinate system is defined so that the origin is at the center of the dipole and the z-axis is aligned with the dipole. Input power to the dipole is

	150W. Assuming the overall efficiency of 75%, find the power density at (300m, 60^0, 0^0)
5B.	A λ/2 dipole, with a total loss resistance of 1 Ω, is connected to a generator whose internal impedance is 45 + j20 Ω. Assuming the peak voltage of the generator is 5 V and the impedance of the dipole, excluding the loss resistance, is 60 + j25 Ω, find the power (a) radiated by the antenna (b) dissipated in the antenna (c) dissipated by the generator internal resistance.
5C.	Sketch the current distribution profile of a $\lambda/2$ dipole at different time instants.
	(5+3+2)