Nepal College of Information Technology

Level: Bachelor | **Semester – Spring** | **Year: 2013**
Program: B.E. | **Full Marks: 100**
Pass Mark: 45
Course: Electromagnetic Propagation and Antenna | **Time: 3 hrs.**

Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.
Attempt all the questions.

1)	A.	Derive the expressions for electric and magnetic field components radiated by an alternating current element.	8
	B.	State and prove reciprocity theorem for an antenna.	7
2)	A.	What is meant by the term "antenna array"? Differentiate between broadside and end-fire array with appropriate mathematical expressions.	7
	B.	Define directive gain of an antenna. Show that the directivity of a half wave dipole is 2.15 dB	8
3)	A.	Describe the working mechanism of a parabolic antenna. What are the feed mechanisms for a parabolic antenna?	6
	B.	Obtain the radiation pattern of two point sources with equal amplitude and spacing (two element array).	9
4)	A.	Define transmission loss. Derive Friis transmission formula.	8
	B.	A microwave link operating at a frequency of 15 GHz has antenna gain of 45 dB each. The receiver is located at a distance of 70 km for line of sight (LOS) communication. Calculate the transmission path loss and received power if the transmitted power is 20 Watts.	7
5)	A.	Clarify the meaning of antenna temperature. Derive the expression for signal to noise ratio in terms of S_A, T_A, T_e, K, B.	7
	B.	In ionospheric propagation, consider that the reflection takes place at a height of 300 km and the maximum density in the ionosphere corresponds to a refractive index of 0.8 at a frequency of 15 MHz. Find the ground range for which this frequency is MUF without taking into account the Earth's curvature.	8
6)	A.	What is plane Earth reflection? Derive an equation for the reflection factor for vertical polarization.	9
	B.	Draw a block diagram of an optical fiber communication system, and explain about each component briefly.	6
7)		Write short notes on (***Any Two***) a) Numerical Aperture b) Horn Antenna c) LASER	2 × 5