JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD
B. Tech III Year I Semester Examinations, December - 2014
ANTENNAS AND WAVE PROPAGATION
(Common to ECE, ETM)

Time: 3 hours   Max. Marks: 75

Answer any five questions
All questions carry equal marks

1.a)   Write a short notes on:
       i) Reciprocity theorem.
       ii) Antenna aperture.
  b)   What is the effective length of an antenna? Determine the effective length of a
       half wave dipole antenna.

2.a)   Derive an expression for radiation resistance of current element starting from the
       expression of radiation fields.
  b)   Show that the radiation resistance of a small loop is equal to $320\pi.4 \; (A/\lambda^2)$ ohms
       where A is loop area.

3.a)   Derive expression for the radiation pattern of a uniform linear array of N-half
       wave dipoles.
  b)   A broadside array operating at 100cm wavelength consists of four half wave
       dipole spaced 50cm. Each element carries radio frequency current in the same
       phase and of magnitude 0.5amp. Calculate
       i) Radiated power
       ii) Half width of the major lobe.

4.a)   Describe the construction and basic principle of operation of a helical antenna
       under
       i) Normal mode of operation
       ii) Axial mode of operation. What are its applications?
  b)   A standard gain horn antenna with a power gain of 12.5, is used to measure the
       gain of a large directional antenna by comparison method. The test antenna is
       connected to the receiver and an attenuator adjusted to 23dB in order to have the
       same receiver output. Find out the gain of the large antenna.

5.a)   Derive the expression for gain of a 90^0 corner reflector.
  b)   A Paraboloid reflector of 1.8m diameter is used at 6GHz. Calculate the beam
       width between the nulls and gains in dBs.

6.a)   Explain about Dielectric Lens antenna in detail.
  b)   Describe the method of measuring the gain and radiation pattern of an antenna.

7.a)   Discuss the characteristics of F_1 and F_2 layers.
  b)   Show that the radius of curvature of ray path is given by $2/(d\varepsilon_r/dh)$ for
       tropospheric waves.

8.a)   Derive the field strength of tropospheric wave.
  b)   Derive the expression for space wave electric field produced by an antenna at a
       distance point, assuming a flat earth.