

Name :

Roll No. :

Invigilator's Signature :

CS/B.Tech/(ECE-New)/SEM-6/EC-604A/2013

2013

ANTENNA THEORY & PROPAGATION

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP - A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following :

10 × 1 = 10

- i) The intrinsic impedance of free space is
 - a) 1 ohm
 - b) 4 ohm
 - c) 120π ohm
 - d) 0 ohm.
- ii) When the polarization of the receiving antenna is unknown, to ensure that it receives at least half the power (except in particular situation), the transmitted wave should be
 - a) horizontally polarized
 - b) vertically polarized
 - c) circularly polarized
 - d) elliptically polarized.
- iii) Microwaves antenna aperture efficiency depends on
 - a) feed pattern
 - b) antenna aperture
 - c) surface losses
 - d) low side lobe level.



- iv) The antenna most commonly used for TV broadcasting in the UHF band is
- a) turnstile antenna b) dipole antenna
c) yagi antenna d) rhombic antenna.
- v) Fields are said to be circularly polarized if their magnitudes are
- a) equal and they are in phase
b) equal and they differ in phase by $\pm 90^\circ$
c) unequal and they differ by $\pm 90^\circ$
d) not equal but they are in phase.
- vi) The current distribution in half-wave dipole is
- a) sinusoidal b) constant
c) triangular d) parabolic.
- vii) The ground wave field strength is
- a) inversely proportional to distance
b) inversely proportional to the square of distance
c) directly proportional to distance
d) directly proportional to the square of distance.
- viii) Power and field patterns are related as
- a) $P \propto E^2$ b) $P \propto E$
c) $P \propto E^{1/2}$ d) $P \propto 1/E$.
- ix) Circularly polarized antenna is
- a) dipole b) parabolic dish
c) yagi-uda d) helical.
- x) Antenna commonly used for microwave links is
- a) loop antenna b) log periodic antenna
c) paraboloidal dishes d) rhombic antenna.



- xi) A half wave dipole used at a frequency of 300 MHz has a length of
- | | |
|--------------|--------------------|
| a) 10 metres | b) 3 metres |
| c) 1 metres | d) 50 centimetres. |
- xii) A log periodic antenna is a
- | |
|----------------------------------|
| a) frequency independent antenna |
| b) frequency dependent antenna |
| c) directional antenna |
| d) none of these. |

GROUP - B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

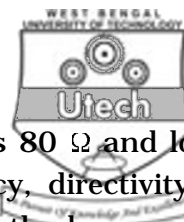
2. What is antenna gain ? How is it related with directive gain and power gain ?
3. Define Yagi-uda antenna and explain its operation.
4. Define the following terms :
 - i) Friss transmission formula
 - ii) Duality theorem.
5. What are the different modes of radio wave propagation ? What do you mean by fading ?
6. Derive the relation between effective area and gain of antenna. Define about noise temperature of antenna.

GROUP - C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) What are the vector potential and retarded vector potential ? $2 + 3$
- b) Define gain, directivity and efficiency of antenna. $2 + 2 + 2$



- c) The radiation resistance of an antenna is 80Ω and loss resistance is 10Ω . Determine efficiency, directivity if the power gain is 20. And also find out the beam solid angle. 1 + 2 + 1
8. Find the radiation resistance of a half wave dipole with uniform current distribution. Explain the design aspects of Yagi-uda antenna. 10 + 5
9. Explain special features of parabolic reflector antenna and discuss on different types of feed used with neat diagram. For N -element array show that the first minor lobe is 13.46 dB down from the major lobe. 5 + 4 + 6
10. a) Define MUF, critical frequency and virtual height. 2 + 2 + 3
- b) At what frequency a wave must propagate for the D region to have an index of refraction 0.6 ? Given $N = 500$ electron / c.c. for D region. 3
- c) In a communication link two identical antennas at 10 GHz are used for propagation of 40 dB. If the transmitted power is 1 W, find the received power, if the range of the link is 30 km. 5
11. Write short notes on any *three* of the following : 3 × 5
- a) Duct propagation
 - b) Loop antenna
 - c) Sky wave propagation
 - d) Microstrip antenna
 - e) Skip distance.