

--	--	--	--	--	--	--	--	--	--

Sixth Semester B.E. Degree Examination, June/July 2016

Antennas and Propagation

Time: 3 hrs.

Max. Marks:100

**Note: Answer FIVE full questions, selecting
at least TWO questions from each part.**

PART – A

- 1 a. Explain the following terms as related to antenna systems:
 - i) Beam area
 - ii) Directivity
 - iii) Power gain
 - iv) Effective aperture
 - v) Radiation resistance

(10 Marks)
- b. Find the directivity of the power pattern given by $U = U_m \sin^2 \theta \sin^3 \phi$; $0 \leq \theta \leq \pi$; $0 \leq \phi \leq \pi$. **(05 Marks)**
- c. An antenna has a field pattern given by $E(\theta) = \cos \theta \cos 2\theta$ for $0 \leq \theta \leq 90^\circ$. Find half power beam width (HPBW) and beam width between first nulls (BWFN). **(05 Marks)**

- 2 a. Derive an expression for array factor and relative field of linear array of 'n' isotropic point sources of equal magnitude and spacing. **(08 Marks)**
- b. Complete the field patterns and find BWFN and HPBW for an array of 4 point sources spaced $\lambda/6$ distance apart. They have a phase difference of $\pi/3$ between adjacent elements. **(06 Marks)**
- c. Explain the principle of pattern multiplication with an example. **(06 Marks)**

- 3 a. Derive the far field components of short dipole. **(07 Marks)**
- b. For a short dipole of $\lambda/15$ long and loss resistance of 1Ω . Find:
 - i) Efficiency
 - ii) Radiation resistance
 - iii) Effective aperture

(06 Marks)
- c. Write short notes on:
 - i) V-antennas
 - ii) Folded dipole antennas
 - iii) Rhombic antenna

(07 Marks)

- 4 a. Derive the far field expressions for small loop antenna. **(07 Marks)**
- b. Explain patch or microstrip antennas with necessary sketch. **(06 Marks)**
- c. With relevant sketches, explain the principle of Babinet's principle for complementary linear antennas. **(07 Marks)**

PART – B

- 5 a. Explain the practical design considerations for the axial mode helical antennas. **(10 Marks)**
- b. Write short notes on:
 - i) Yagi-Uda antenna
 - ii) Corner reflector antenna

(10 Marks)

- 6 a. Explain the constructional details of Sleeve antenna and Turnstile antenna. (08 Marks)
b. Write short notes on:
i) Embedded antennas
ii) Ultra wideband antennas
iii) Plasma antennas (12 Marks)
- 7 a. Derive an expression for wave tilt of surface wave. (08 Marks)
b. Explain duct propagation in detail. (06 Marks)
c. Estimate the wave tilt in degrees of the surface wave over an earth of 5 millimhos conductivity and relative permittivity of 10 at 1 MHz. (06 Marks)
- 8 a. Derive an expression for refractive index of an ionospheric propagation. (06 Marks)
b. A high frequency link is established for a range of 2000 km. If the reflection region of ionosphere is at a height of 200 km and has a critical frequency of 6 MHz, calculate maximum usable frequency (MUF). (06 Marks)
c. Define the following terms related to ionospheric propagation:
i) MUF
ii) Critical frequency
iii) Virtual height
iv) Skip distance (08 Marks)

* * * * *