7E7081

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# 7E7081

## B. Tech. VII Sem. (Main/Back) Exam., Nov.-Dec.-2016
## Electronics &Communication Engineering
## 7EC1A Antenna & Wave Propagation

**Time: 3 Hours**

**Maximum Marks: 80**
**Min. Passing Marks Main : 26**
**Min. Passing Marks Back: 24**

*Instructions to Candidates:*

*Attempt any **five questions,** selecting **one question** from **each unit.** All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

*Units of quantities used/calculated must be stated clearly.*

*Use of following supporting material is permitted during examination. (Mentioned in form No. 205)*

1. NIL 2. NIL

## UNIT – I

Q.1 (a) A transmitting antenna carries current of 20 A (rms) at a frequency of 170 kHz and produces a field strength of 1.8 mV/m at a distance of 20 km. Estimate the effective height of the antenna. [8]

(b) Define the following terms:- [2×4=8]

(i) Isotropic radiator

(ii) Beam width of an antenna

(iii) Directivity of an antenna

(iv) Gain of an antenna

**OR**

Q.1 (a) A thin dipole antenna is t/15 long. If its loss resistance is 1.5 Ω, find radiation resistance and the efficiency. [4×2=8]

(b) Write short note on: - [4×2=8]

(i) Antenna Temperature

(ii) Polarization

## UNIT – II

Q.2 (a) For a end five array consisting of several half wave length long isotropic radiators is to have a directive gain of 30. Find the array length and width of the major lobe (i. e. beam width between first nulls). What will be these for a broadside array? [8]

(b) Explain the principles of End-five and broadside arrays. [8]

**OR**

Q.2 (a) A Uniform linear array consists of 16 isotropic point sources with a spacing of λ/4. If the phase difference δ = - 90°, calculate - [2×4=8]

(i) HPBW

(ii) Beam solid angle

(iii) Directivity

(iv) Effective aperture.

(b) Prove that the directivity of an end five array of the point source spaced at a distance apart is given by [8]

$$D(\theta)=\frac{2}{1+\frac{\sin 2\beta d}{2\beta d}}$$

## UNIT – III

Q.3 (a) What are the different types of antennas used at very high frequencies? Explain the working of a folded dipole antenna. [8]

(b) Find out the beam width between first nulls and power gain of a 2m paraboloid reflector operating at 6000 MHz. [8]

**OR**

Q.3 (a) Explain with suitable diagrams the working of the log periodic antenna. What are the practical applications of these antennas? [8]

(b) Write short note on :- [4×2=8]

(i) Helical antenna

(ii) Yagi - uda antenna.

## UNIT – IV

Q.4 (a) Explain the mechanism of radio wave propagation. [8]

(b) What is tropospheric scattering? What are the frequency ranges for it? Why are such ranges only applicable for tropospheric scattering? [8]

**OR**

Q.4 (a) What do you understand duct propagation? How are ducts formed? What are its merits, advantages and limitations? [8]

(b) If $h_t$ and $h_r$ are the heights in meters of transmitting and receiving antennas above the ground, show that maximum separation between them for line of sight transmission is $D_{max} = 3.57\left[\sqrt{h_t} + \sqrt{h_r}\right]$km [8]

## UNIT – V

Q.5 (a) Derive the expression for the Refracting Index of the Ionosphere. [8]

(b) At what frequency a wave must propagate for the Dregion to have an index of refraction 0.6. Given N = 300 election/$cm^3$ for Dregion. [8]

**OR**

Q.5 (a) Explain the effects of earth's magnetic field on ionospheric wave propagation. [8]

(b) $F_2$ layer of the ionosphere has an electron density of $0.81 \times 10^{12}$ per $M^3$ at a height of 350 km from the earth's surface. Find the critical frequency of this layer. Also find the maximum usable frequency between two stations 1500 kms apart. Neglect earth's curvature. [8]

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