

7E7081

Roll No. _____

Total No of Pages: 3

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]
- Isotropic radiator
 - Beam width of an antenna
 - Directivity of an antenna
 - Gain of an antenna

OR

- Q.1 (a) A thin dipole antenna is $l/15$ long. If its loss resistance is 1.5Ω , 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 fire 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-fire and broadside arrays. rtuonline.com [8]

OR

- Q.2 (a) A Uniform linear array consists of 16 isotropic point sources with a spacing of $\lambda/4$. If the phase difference $\delta = -90^\circ$, calculate - [2×4=8]
- (i) HPBW
- (ii) Beam solid angle
- (iii) Directivity
- (iv) Effective aperture.
- (b) Prove that the directivity of an end fire 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 $D_{\max} = 3.57 \left[\sqrt{h_t} + \sqrt{h_r} \right] \text{ km}$ [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 $N = 300 \text{ electron/cm}^3$ 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 0.81×10^{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]