Roll No. ⬚⬚⬚⬚⬚⬚⬚⬚⬚⬚⬚   Total No. of Pages : 02

Total No. of Questions : 18

B.Tech.(Electronics & Electrical Engg.) (2012 to 2017)   (Sem.–7)
B.Tech.(Electrical & Electronics Engg.) (2013 & Onwards)
ANTENNA & WAVE PROPAGATION
Subject Code : BTEEE-801
M.Code : 71962

Time : 3 Hrs.   Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :
1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

Answer briefly :

1. Define slot antenna.

2. Define directivity for an antenna and write down the various expressions for directivity.

3. Describe the fundamental propagation modes of radio waves.

4. Define radiation resistance for an antenna. What is the radiation resistance for half wave dipole?

5. Write down the range of frequencies for different modes of radio wave propagation.

6. What do you mean by antenna arrays?

7. What do you mean by effective aperture?

8. Differentiate between actual and virtual height.

9. A plane wave is characterized by

    $E = (0.5x + ye^{j\Pi/2}) e^{j(wt-kz)}$. Find out the wave polarization with orientation.

10. Consider a lossless antenna with a directive gain of **+6 dB**. If **1 mW** of power is fed to it then what will be the total power radiated by the antenna.

SECTION-B

11. A plane wave is incident on a short dipole with same polarization and current on the dipole is assumed constant and in phase over its entire length and the terminating resistance R_T is assumed equai to the dipole radiation resistance R_r, the antenna loss resistance is assumed equal to zero. What is a) the dipole's maximum effective aperture and b) its directivity?

12. Calculate the exact directivity of a unidirectional antenna if the normalized power pattern is given by a) $P_n = \cos \theta$ b) $P_n = \sin^2 \theta$. in all cases these patterns are unidirectional (in + Z direction) with having Pn having a value only for Zenith angle $0 \le \theta \le 90$ and with $P_n = 0$ for $90 \le \theta \le 180$. The patterns are independent of the azimuth angle θ.

13. Derive an expression for $E(\phi)$ for an array of two identical (non-isotropic) out of phase point sources separated by a distance of $d = \lambda/2$, each source having normalized field pattern in the ϕ plane is given by $\sin \phi$. Also plot, approximately, normalized filed pattern.

14. Calculate the gain, FNBW and HPBW of parabolic reflector antenna which is operating at 10 GHz and diameter of its circular aperture is 6 λ.

15. The refractive index of an ionospheric layer is 0.8 and MUF is 9 MHz. If the height of the ionospheric layer is 400 km above the earth's surface, then find out the maximum electron density, critical frequency and distance between transmitter and receiver assuming that earth's surface is flat.

SECTION-C

16. Derive the expressions for maxima, minima, FNBW and directivity of N-elements Uniform linear end fire array.

17. Derive the fields radiated from a short electric dipole with linear current distribution over its length.

18. Write short notes on following :

    a. Maximum usable frequency

    b. Tropospheric propagation

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.