G 472 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2014

Sixth Semester

Branch : Electronics and Communication Engineering

RADIATION AND PROPAGATION (L)

(Old Scheme—Prior to 2010 Admissions)

[Supplementary/Mercy Chance]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions briefly.*
Each question carries 4 *marks.*

1. Define and explain effective aperture and effective height of an antenna.
2. Explain, with basic equations, the principle of radiation from accelerated charges.
3. Discuss the main features of broadside array and end fire array.
4. Explain Chebyshev arrays.
5. Explain the basic characteristics of microstrip antenna.
6. Explain the working of folded dipole antenna, with the help of its radiation pattern.
7. Distinguish clearly between maximum usable frequency and lowest usable high frequency with reference to ionospheric propagation.
8. Discuss various layers available above the earth's surface and the propagation paths of radiowaves with the help of diagrams.
9. Define beam area with a figure. Show that the total solid angle inside a sphere is equal to 41253 square degrees.
10. Define directivity of an antenna. Give the relation between directivity and antenna efficiency factor.

(10 × 4 = 40 marks)

Part B

Answer **all** *questions.*
Each full question carries 12 *marks.*

11. (a) Define and explain the following as referred to antenna :

(i) Radiation pattern. (ii) Radiation intensity.

(iii) Gain. (iv) Beam width.

(4 × 2 = 8 marks)

Turn over

(b) Define isotropic source. Draw and explain its radiation pattern. (4 marks)

Or

12. Derive the expression for maximum effective aperture of an antenna and show that the directivity of an antenna is $D = \frac{4\pi A}{\lambda^2}$, where A is the maximum effective aperture of the antenna.

13. (a) Using the principle of pattern multiplication, show that linear array with binomial amplitude distribution has a pattern with no minor lobes.

(6 marks)

(b) What is an antenna array ? What are the four basic parameters which determine the pattern of an array ?

(6 marks)

Or

14. (a) Draw the radiation pattern for end fire array of $n = 4$, $d = \frac{\lambda}{2}$ m. (6 marks)

(b) Derive the expression for the electric field of two isotropic point sources of equal amplitude and inphase currents. Origin is at the middle of the array.

(6 marks)

15. Explain the following, giving their applications :

(i) Rhombic antenna.

(ii) Yagi-Uda antenna.

(iii) Inverted V antenna.

(3 × 4 = 12 marks)

Or

16. Distinguish between antenna height and effective height of antenna. Explain the effect of ground on antenna performance.

17. (a) What is meant by "critical frequency" and "virtual height" ? (4 marks)

(b) Discuss the regular and irregular variation of the ionosphere. (4 marks)

(c) Discuss the effect of the earth's magnetic field on the ionosphere. (4 marks)

Or

18. (a) Explain the reflection and refraction of electromagnetic waves by ionosphere. (7 marks)

(b) Communication is to be established between two stations 1500 km. apart. Calculate the maximum frequency you may choose for communication using the ionosphere as reflector if the height and the plasma frequency of the ionosphere at the point of reflection are 250 km. and 12 MHz respectively. Assume the ionosphere to be thin and the earth to be flat.

(5 marks)

19. Derive the power radiated by a half-wave dipole and obtain its radiation resistance. Take

$$\frac{1}{2}\int_0^{\pi}\left(\frac{1+\cos(\pi\cos\theta)}{\sin\theta}\right)d\theta = 1.219.$$

Or

20. (a) Explain beam efficiency and directivity of an antenna. (6 marks)

(b) Show that the impedance of an isolated antenna when used for receiving is the same as when used for transmitting. (6 marks)

[5 × 12 = 60 marks]