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**Question Paper Code : 40966**

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2018

Sixth Semester

Electronics and Communication Engineering

EC6602 – ANTENNA AND WAVE PROPAGATION

(Regulations 2013)

Time : Three Hours Maximum : 100 Marks

Answer ALL questions

PART – A (10×2=20 Marks)

1. Draw the structure of 3-elements yagi-uda antenna and give the dimensions and spacing between the elements in terms of wavelength.
2. If the noise figure of the antenna at room temperature is 2dB, what is the effective noise temperature.
3. State Huygen's principle.
4. Write any two differences between slot antenna and its complementary dipole antenna.
5. What is phased array ?
6. State Pattern multiplication.
7. What is a frequency independent antenna ?
8. Mention the requirements of an Anechoic chamber.
9. A pulse of a given frequency transmitted vertically upward is received back after a period of 2 ms. Find the virtual height of the reflection layer.
10. What is meant by fading ?

PART – B (5×13=65 Marks)

11. a) Obtain the expressions for power radiated and the radiated resistance of a half wave dipole. (13)

(OR)

b) i) Derive FRIIS transmission formula. (5)

ii) Calculate the directivity of an antenna the power pattern is given by, (5)

$$U(\theta,\phi)=\begin{cases}\sin\theta\sin\phi & 0\le\theta\le\pi;\ 0\le\phi\le\pi\\ 0 & 0\le\theta\le\pi;\ \pi\le\phi\le 2\pi\end{cases}$$

iii) Sketch the radiation pattern of dipole antenna for the following lengths (a) 0.25λ (b) 1.0λ (c) 1.5λ. (3)

12. a) Explain the principles of operation of horn antenna and discuss the various forms of Horn antenna. Obtain the design equations of Horn antenna. (13)

(OR)

b) Explain the radiation mechanism of a microstrip antenna with suitable illustrations. With suitable figures explain the various feed techniques. (13)

13. a) Derive the expression for the array factor of a linear array of four isotropic element spaced λ/2 apart fed with signals of equal amplitude and phase. Obtain the directions of maxima and minima. (13)

(OR)

b) Design a broadside Dolph-Tschebyscheff array of 10 elements with spacing 'd' between the elements and with a major-to-minor lobe ratio of 26 dB. Find the excitation coefficients and form the array factor. (13)

14. a) Explain the measurement procedure for the measurement of gain and VSWR. (13)

(OR)

b) Describe construction and basic principles of operation of a helical antenna under normal mode and axial mode helical antenna. (13)

15. a) Discuss in detail about the structure of atmosphere and the different modes of propagation. **(13)**

(OR)

b) Derive the expression for the maximum usable frequency for the flat earth, interms of the critical frequency, distance between transmitter and receiver and height of the ionospheric layer. **(13)**

PART – C **(1×15=15 Marks)**

16. a) Design a 50 to 200 MHz log periodic dipole antenna for gain corresponds to scale factor 0.8 and space factor 0.15. Assume the gap spacing at the smallest dipole is 3.6 mm. **(15)**

(OR)

b) i) What is the radio horizon of a television antenna placed at a height of 166 meters ? If the signal is to be received at a distance of 66 km, what should be the height of the receiving antenna ? **(3)**

ii) Determine the change in the electron density of the E-layer, when the critical frequency changes from 4 MHz to 1 MHz between mid-day and sun-set periods. **(8)**

iii) Explain the principle of multi hop transmission. **(4)**

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