7E7081

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B.Tech. VII- Semester (Main&Back) Examination, Nov. - 2019
Electronics And Comm. Engg.
7EC1A Antenna And Wave Propagation

Time : 3 Hours

Maximum Marks : 80
Min. Passing Marks : 26

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.

UNIT - I

1. a) Describe ideal dipole and short dipole antenna. (6)

   b) Describe the difference between directivity and gain. Are they the same in any case? (4)

   c) Prove that the radiated power of quarter wave monopole is $P_r = 36.5\, I_{in}^2$. (6)

(OR)

1. a) Draw the equivalent circuit of antenna. Also define the polarisation, antenna front to back ratio (FBR), Antenna band width. (8)

   b) Determine the maximum effective aperture and directivity of a short dipole supposed to be operated at f = 450 MHz. (8)

UNIT - II

2. a) What are the advantages of array antenna? Describing principle of pattern multiplication and sketch the radiation pattern of a three - element array separated at $\lambda/2$. (8)

   b) Calculate the directivity a broad side stacked antenna of height 10.5 m and length 21 m in dB, if operating frequency f = 3.5 GHz. (8)

(OR)

2. a) Distinguish between endfire and broadside arrays. Show that array of two isotropic sources fed with equal amplitudes and opposite phases acts as an end - fire array. (8)

   b) Describe and draw the radiation pattern of 4-isotropic sources of equal amplitudes and phases in broadside and end-fire arrays. (8)

UNIT - III

3. a) Compare half - wave dipole, folded dipole antenna and V - dipole antennas in terms of designs and radiation characteristics. (8)

b) What are the characteristics features of circular end square loop antennas? Write the expressions for their far fields. (8)

(OR)

3. a) Describe the principle of operation of Yagi - Uda antenna. Explain its properties with reference to directivity and bandwidth. (8)

b) Describe the design procedure of rectangular patch antenna with a suitable example. Write its applications. (8)

UNIT - IV

4. a) Describe the effect of frequency, earth constant and earth curvature on surface wave propagation. (8)

b) Describe the troposphere and troposphere wave propagation. Also justify the statement "Microwave communication is only due to tropospheric propagation". (8)

(OR)

4. a) Define the terms surface and elevated ducts and duct gradient. Also describe duct propagation. (8)

b) Show that for space wave propagation the filed intensity at the receiver is given by $E_R = \frac{88\sqrt{P}h_t h_r}{\lambda d^2}$ v/m. (8)

UNIT - V

5. a) Describe the ionosphere reflection of radio waves. Derive an expression for critical frequency of a reflecting layer in terms of its ionization density. (8)

b) Describe D,E,F, and G layers of the ionosphere. (4)

c) Estimate the maximum electron density of an ionosphere layer for a critical frequency 5.5 GHz. (4)

(OR)

5. a) Write notes on virtual height, skip distance, maximum usable frequency, and optimum working frequency. (8)

b) For a mobile communication over a height of 120 km via ionosphere layer with $N_{max} = 2.22 \times 10^5$ electrons/m^3, the maximum frequency estimated to be is 6.5 KHz. Find the optimum working frequency, critical frequency, and elevation angle of beam and path range. (8)