7E4044

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B. Tech. VII Semester (Main/Back) Examination 2014

ELECTRONICS & COMMUNICATION # ⑦EC① Common with ⑦AI⑥.①

ANTENNA AND WAVE PROPAGATION

Time : 3 Hours | Min. Passing Marks : 24 | Maximum Marks : 80

Instruction 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*) Find the expression of radiated power by Half wave dipole. [10]

(*b*) What is the effective area of a half wave dipole operating at 500 MHz. [6]

OR

1. (*a*) Write the Reciprocity theorem and explain it for two antennas. [6]

(*b*) The effective antenna temperature of a target at the input terminals of the antenna is 150K. Assuming that the antenna is maintained at a thermal temperature of 300K and has a thermal efficiency of 99% and it is connected to a receiver through an X-band (8.2-12.4GHz) rectangular waveguide of 10m (loss of wave guide = 0.13dB/m) and at a temperature of 300K, find the effective antenna temperature at receiver terminals. [6]

(*c*) Write different types of polarization. [4]

Unit-'II'

2. (*a*) The aperture dimensions of a pyramidal horn are 12×6cm. It is operating at a frequency of 6GHz. Find the beam width power gain and directivity. [6]

(*b*) Explain the working of helical antennas with its features and applications. [10]

OR

2. (*a*) Define the characteristics of slot antenna and write the expression of impedence with the suitable diagram. Show the feeding method. [12]

(*b*) A parabolic reflector with a mouth diameter of 22 m. Operates at f = 5GHz it has illumination efficiency of 0.6. Find the power gain. [4]

Unit-'III'

3. (*a*) Explain the method of polarization measurement of an antenna. [8]

(*b*) Find the Null-to-Null beam width of end fire array and broad side array.

(i) When the array length $l = 10\lambda$, N = 20

(ii) $l = 50\lambda$ and N = 100 [8]

OR

3. (*a*) Explain the method of phase measurement of an antenna. [8]

(*b*) Define Binomial arrays. [4]

(*c*) An array contains 100 isotropic radiators with an inter element spacing of 0.5λ. It is required to produce end fire beams.

(i) Null to Null beam width

(ii) Directivity [4]

Unit-'IV'

4. (*a*) Find the expression for field strength due to space wave. Briefly explain the effect of the curvature of the earth and effect of polarization. [12]

(*b*) Briefly explain the Duct propagation. [4]

OR

4. (*a*) A sky wave is incident on D-layer at an angle of 40°. Find the angle of refraction if the frequency of the transmitted wave is 75MHz. [8]

(*b*) Define the reflection of radio waves by the surface of the earth also write the field strength of groundwave. [8]

Unit-'V'

5. (*a*) Write the definitions of following

(i) Virtual height

(ii) Skip distance

(iii) Maximum usable frequency

(iv) Critical frequency

(v) Multi hop transmission [2×5=10]

(*b*) Determine the critical frequency of EM wave for D($N = 400$ e/cm^3) and E (5×10^5 electron/cm^3) layers. [3]

(*c*) Determine the range of LOS if the height of the transmitting is 60 m and the height of the receiving antenna is 6m. [3]

OR

5. (*a*) What is the critical angle of propagation for D layer if the transmitter and receiver are separated by 500km. [6]

(*b*) Briefly explains the characteristics of different ionospheric layers. [6]

(*c*) Define the effect of earth's magnetic field and solar activity in brief. [2×2 = 4]