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10EC64

Sixth Semester B.E. Degree Examination, Jan./Feb.2021
Antenna and Propagation

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Explain the following parameters with respect to antenna systems:
   (i) Directivity
   (ii) Radiation intensity
   (iii) Beam width **(09 Marks)**

b. Show that maximum effective aperture of $\frac{\lambda}{2}$ dipole is $0.13\lambda^2$. **(06 Marks)**

c. State and prove Frii's transmission formula. **(05 Marks)**

2 a. Find the directivity for the source with unidirectional cosine squared power pattern. **(05 Marks)**

b. Derive the expression for Array factor in case of linear array of 'n' isotropic sources of equal amplitude and spacing. **(10 Marks)**

c. A linear array consists of 4 isotropic point sources. The distance between adjacent elements is $\frac{\lambda}{2}$. The power is applied with equal magnitude and a phase difference of –dr. Obtain the field pattern and find BWFN and HPBW. **(05 Marks)**

3 a. Derive an expression for radiation resistance of a short electric dipole. **(08 Marks)**

b. Write short notes on folded dipole antennas. **(06 Marks)**

c. For a short dipole $\frac{\lambda}{15}$ long, find the efficiency, radiation resistance if loss resistance is 1 Ω. Find also the effective aperture. **(06 Marks)**

4 a. Derive an expression for far field components of a small loop antenna. **(08 Marks)**

b. State and explain the Babinet's principle. **(06 Marks)**

c. Obtain the value of impedance of slot antenna in terms of its complimentary dipole antenna impedance Z_d. **(06 Marks)**

PART – B

5 a. Explain the features of an helical antenna and the practical design considerations of the helical antenna. **(10 Marks)**

b. Write short notes on:
   (i) Yagi-Uda antenna
   (ii) Sleeve antenna. **(10 Marks)**

6 a. Explain different types of rectangular and circular horn antennas. Also derive the design equations for rectangular horn antennas. **(10 Marks)**

b. Explain : (i) Turnstile antenna (ii) Ultra wide band antennas. **(10 Marks)**

7 a. Draw and explain different ionized layers in ionospheric propagation. **(10 Marks)**

b. Explain duct wave propagation. **(05 Marks)**

c. Explain the phenomenon of Faraday Rotation and how measurement of total electron content is done for an ionospheric propagation. **(05 Marks)**

8 a. Define the terms with respect to wave propagation :

(i) Skip distance
(ii) Critical frequency.
(iii) Virtual height.
(iv) Maximum usable frequency. **(08 Marks)**

b. Derive the expression for critical frequency in terms of maximum electron density N_{max} . **(09 Marks)**

c. A HF radio link is established for a range of 2000 km. If the reflection region of the ionosphere is at a height of 200 km and has a critical frequency of 6 MHz. Calculate MUF. **(03 Marks)**

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