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53 (EC 710) AWPR

2021

(Held in 2022)

ANTENNA AND WAVE PROPAGATION

Paper : EC 710

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. *(a)* Describe with necessary figure, the radiation mechanism from a single wire.

   (b) How does oscillating dipoles radiate ?

   (c) What are the different field regions surrounding a radiating antenna ? Describe each of them.

Contd.

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(d) Show graphically, how does the antenna amplitude pattern shape changes from reactive near field towards the far field.

5+5+6+4

2. (a) What are auxiliary potential functions ? Why are they used to find the radiation fields ?

(b) Derive the expressions of radiation fields E and H using auxiliary functions.

(2+3)+15

3. (a) What are the different types of antenna polarization ? Discuss each of them.

(b) What is the axial ratio ? What is its value for different types of polarizations ?

(c) What is the difference between $3dB$ beamwidth and $3dB$ AR beamwidth of an antenna ?

(d) What does AR bandwidth mean ?

(1+9)+(2+2)+3+3

4. (a) What is loop antenna ?

(b) Why is it so important ?

(c) Derive the expressions for far field and radiation resistance of a square loop antenna.

2+2+16

5. *(a)* Derive the expressions for the fields in the far field zone of a finite length infinitesimally thin dipole with current distribution

$$I_e(z') = I_0 \sin\left[k\left(\frac{l}{2} - z'\right)\right] \quad \text{for} \quad 0 \le z' \le \frac{1}{2}$$

$$I_e(z') = I_0 \sin\left[k\left(\frac{l}{2} - z'\right)\right] \quad \text{for} \quad -\frac{1}{2} \le z' \le 0$$

Also derive the expression for the radiation resistance.

(b) Using the above derivation, find the radiation resistance for a half-wave dipole. 15+5

6. *(a)* What are the advantages and disadvantages of microstrip patch antenna ?

(b) How does microstrip antenna radiate ?

(c) What is fringe field ? How does it modify the length of the antenna ?

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(d) What are the different types of feeding techniques used? Compare these methods in terms of spurious feed radiation, reliability, fabrication, impedance matching and bandwidth.

4+4+(3+2)+(2+5)

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