

## RF Modeling &amp; Antennas

QP Code : 14910

(3 Hours)

[ Total Marks : 80

N. B. : (1) Question No. 1 is **compulsory**.

(2) Attempt any 3 (three) out of the remaining 5 (five) questions.

(3) Assume suitable data wherever necessary. Justify the assumption.

(4) Draw suitable diagrams wherever necessary.

1. (a) Compare striplines and Microstrip lines. 5
- (b) Explain the significance of Retarded magnetic vector potential and Retarded electric Scalar potential. 5
- (c) With suitable example explain pattern Multiplication for Antenna Arrays. 5
- (d) Explain how Richard's Transformation and unit elements are useful in RF filter designing. 5
2. (a) Explain with equivalent circuits the RF behavior of Resistor, Inductor and Capacitor. 10
- (b) Design a maximally flat LPF with a cut-off frequency of 2GHz; generator and Load Impedance of 50  $\Omega$ ; and with 15 dB Insertion Loss at 3 GHz with discrete LC components. 10
3. (a) Using Image Parameter method design a Low-pass composite filter with a cut-off frequency 2 MHz and Impedance of 75  $\Omega$ . Place the Infinite attenuation pole at 2.05 MHz. 10
- (b) Derive Array factor of N-element liner array, where all elements are equally fed and spaced. Also find the expression for the position of principle maxima, nulls and secondary maxima. 10
4. (a) Design a broadside Dolph-Tchebyshev array of 6 elements with spacing 'd' between the elements and with a major to minor lobe ratio of 26 dB. Calculate the excitation coefficients. 10
- (b) Explain the working principle of Yagi-Uda Antenna and draw its radiation pattern. Mention its applications. 10
5. (a) Explain the structure of Microstrip Antenna. Discuss its feed mechanisms and Applications. 10



(b) Explain the following terms related to Basic Antenna concepts with relevant equations :— 10

- (a) Radiation Resistance
- (b) Effective aperture
- (c) Beam width
- (d) Directivity
- (e) Antenna efficiency.

6. Write short notes on the following :—

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- (a) Friss Transmission formula
  - (b) Ground effect in Antenna
  - (c) Near field and far field Radiation related to Antenna
  - (d) Log Periodic Antenna.
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