

1. Question No. 1 is compulsory.
2. Out of remaining questions, attempt any three questions.
3. Assume suitable additional data if required.
4. Figures in brackets on the right hand side indicate full marks.

- Q.1. (A) What do you mean by antenna efficiency? How is it different from radiation efficiency? (5)
- (B) What are the advantages and disadvantages of smart antenna systems? (5)
- (C) Design a rectangular microstrip antenna (RMSA) at 2.5 GHz using 0.8 mm duroid substrate of dielectric constant 2.2 and loss tangent 0.001. (10)
- Q.2. (A) Draw and explain various feeding techniques and their equivalent circuit and also mention their advantages and disadvantages. (10)
- (B) What are the necessary conditions to obtain circular polarization? What are the various techniques to design a single feed circularly polarized MSA? (10)
- Q.3. (A) Draw and explain any two techniques to increase the 3 dB axial ratio bandwidth of a microstrip antenna. (10)
- (B) What are the various parameters on which impedance bandwidth of MSA antenna depend? Using VSWR plot or impedance variation plot, explain effect of two such parameters on impedance bandwidth. (10)
- Q.4. (A) Why compact antennas provide low efficiency and narrow bandwidth? Explain different methods to design compact microstrip antennas. (10)
- (B) Explain radiating coupled methods used for bandwidth enhancement of RMSAs. (10)
- Q.5. (A) Why planar monopole antennas provide broad impedance bandwidth? Derive an expression for lower frequency of a planar circular monopole antenna. (10)
- (B) Design a stacked multi-resonator antenna with rectangular patches which can provide at least 20% impedance bandwidth. (10)
- Q.6. Write short notes on following:
- (A) Challenges in MIMO antenna design. (10)
- (B) Antennas using metamaterials. (10)

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