Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/M.Tech (ECE)/SEM-3/MEC-1102A/2009-10

2009

SMART ANTENNAS

Time Allotted : 3 Hours Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Answer any *five* questions. 5 × 14 = 70

1. Explain with necessary diagrams, the cellular radio concept. What are macrocell, microcell and picocell ? 7 + 7

2. Explain with necessary diagrams the multiple access interference (MAI) in DS-CDMA systems. What are power control and the near-for problem in CDMA ? 8 + 3 + 3

3. What are the key benefits of smart antenna ? Develop a base-band complex envelope model of a LES array with necessary expressions for array factor, weight vector, data vector and array manifold. What are spatial processing receivers ? 3 + 7 + 4

4. Design a software radio with a sampling rate of 7·3728 MSPS, with a signal centre frequency of 1·8432 MHz. The Radio should incorporate a FIR filter with down conversion and decimation. What are polyphase filters ? 10 + 4

5. Explain the functioning of a spatial filtering RAKE receiver. Explain with necessary signal patterns, the working of each finger of the spatial filtering RAKE receivers. How is down-link beam forming for IS-95 CDMA carried out ? How is the systems improved in the CDMA 2000 ? Write with the help of auxiliary pilots. 3 + 3 + 5 + 3

6. Obtain an expression of total interference in terms of In-cell Interference and out of Cell Interference in a reverse channel of multi-cell systems with spatial filtering at the base station. What are Reuse Factor, Rate Set 1 and Rate Set 2 in CDMA systems. 10 + 4

7. What are Spatio-Temporal channel models for smart antennas ? Using the Geometrically Based Single Bounce Elliptical Model (GBSBEM), obtain an expression for the conditional pdf for the Direction Of Arrival (DOA). 4 + 10

8. What are adaptive algorithms ? What are the different adaptive algorithms for CDMA ? Why Gram-Schmidt orthogonalisation is required in the Multitarget least squares constant modulus algorithm ? Describe the Multitarget decision directed algorithm stepwise. 3 + 3 + 4 + 4

9. Explain the Delay-and-Sum method for the DOA estimation, with necessary diagrams. What are the advantages of the subspace methods for DOA estimation over conventional methods ? Describe the steps of the MUSIC algorithm for DOA estimation. What are the limitations of the MUSIC algorithm. 4 + 3 + 4 + 3