

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-far problem in CDMA ?

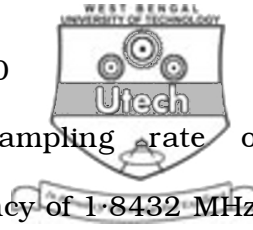
8 + 3 + 3

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

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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.

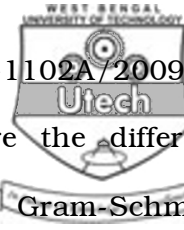
3 + 3 + 5 + 3

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. $4 + 3 + 4 + 3$
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