Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

SEVENTH SEMESTER B.TECH. (E & C) DEGREE END SEMESTER EXAMINATION
DECEMBER 2018
SUBJECT: SPREAD SPECTRUM COMMUNICATION (ECE - 4012)

TIME: 3 HOURS **MAX. MARKS: 50**

Instructions to candidates

- Answer **ALL** questions.
- Missing data may be suitably assumed.
- Show all intermediate steps while solving numerical or in a derivation.

1A. Find the first 7 chips of a Gold code created from the following two *m*-sequences. Provide the shift register implementation for the *m*-sequences and the Gold code.

	Generate polynomial	Initial State
m-sequence 1	[103]	1 1 1 1 1 1
m-sequence 2	[155]	1 1 0 0 1 1

Clearly show all the intermediate steps.

1B. Find the number of sequences and the magnitude of the worst-case cross-correlation over a code period for spreading codes generated from the small and large Kasami sequences with $n = 10$.

1 C Find the processing gain (in dB) and jamming margin (in dB) for direct sequence spread spectrum (DSSS) system with chip duration of 0.1 μs and bit duration of 0.1 ms, desired received SNR after despreading of 15 dB and system loss of 5 dB.

(4+3+3)

2A. Describe the working principle of frequency hopping spread spectrum (FHSS) system with the help of a neat labelled block diagram for transmitter and receiver.

2B. Compare slow and fast FHSS systems. A hopping bandwidth W_{ss} of 400 MHz and a frequency step size Δf of 100 Hz are specified. What is the minimum number of PN chips that are required for each frequency word ?

(5+5)

3A. Explain the spreading and despreading operation in the BPSK DSSS system with the help of a block diagram of BPSK DSSS transmitter and receiver (provide the necessary equations). Also, neatly sketch the different waveforms involve in BPSK direct-sequence spreading operation.

3B. With the help of a block diagram of RAKE receiver, explain how RAKE receiver is similar and different from maximal ratio combiner.

(5+5)

4A. Describe the direct-sequence parallel search acquisition system with the help of a neat labelled block diagram. Support your answer with suitable expressions wherever necessary.

4B. Consider a direct-sequence spread-spectrum system using a spreading code clock frequency f_c = 3MHz. Suppose that the received carrier power-to-noise power spectral ratio is 46.25 dB-Hz. What sweep rate is required to yield a single sweep (P_d , P_{fa}) pair equal to (0.9, 10^{-6}) and corresponding maximum SNR is 13.4 dB. Determine the average acquisition time and maximum acquisition time for serial search acquisition system? Assume $N_c = 10^6$, K = 100, $\lambda = 500$.

([5+5)

5A. Describe the direct-sequence CDMA with the help of a neat labelled block diagram. Support your answer with suitable expressions wherever necessary.

5B. Sketch the one-sided power spectral densities for the different types of jamming signals. Describe how single-tone jammer and multiple tone jammer affects the performance of DSSS and FHSS.

(5+5)