MANIPAL INSTITUTE OF TECHNOLOGY

(A constituent unit of MAHE, Manipal)

SIXTH SEMESTER B.TECH. (E & C) DEGREE END SEMESTER EXAMINATION JUNE 2019

SUBJECT: MOBILE COMMUNICATIONS (ECE - 4010)

TIME: 3 HOURS

MAX. MARKS: 50

Instructions to candidates

- Answer **ALL** questions.
- Missing data may be suitably assumed.
- 1A. Draw the timing diagram that represents a call establishment to a Landline subscriber initiated by a GSM Mobile user.
- 1B. If a cdma2000 radio has a receiver thermal noise floor -108 dBm, and the minimum SNR to detect the signal is 5 dB, find the receiver sensitivity.
- 1C. The voice traffic on a line is given below during a period of 90 minutes. Calculate the traffic density.

Call no	Duration of calls (seconds)
1	60
2	74
3	80
4	90
5	92
6	70
7	96
8	48
9	64
10	126

(4+3+3)

- 2A. Define handoff and illustrate it at the cell boundary with necessary diagrams. Also explain the different handoff strategies.
- 2B. A cellular system of 32 Cells with a cell radius of 1.6 km, a total frequency bandwidth that supports 336 traffic channels, and a reuse factor of N = 7. What is the geographical area covered, how many channels are there per cell, and what is the number of concurrent calls that can be handled?
- 2C. Explain the techniques to improve Coverage and Capacity in Cellular Systems with necessary diagrams.

(4+3+3)

- 3A. In free space wave propagation, a Tx transmits a signal with a power of 50 W and unity gain and carrier frequency of 900MHz. If there is Rx at a distance of 10km with antenna gain equal to 2, calculate:
 - i) the power at the Rx ii) the magnitude of the E-field at the Rx antenna,

iii) the rms voltage applied to the Rx input.

Assume that the Rx antenna has an impedance of 50ohms and is matched to the Rx.

- 3B. i) For a vehicle travelling 50 m/s with 1900 MHz carrier frequency, find the coherence time of the channel as per the definition of coherence time modern Digital Communications.
 - ii) Explain the features of Okumura path loss model with necessary equations. Also mention its disadvantages.
- 3C. Explain the hidden and exposed terminal problems in a wireless channel with suitable examples. Also give the steps to resolve them.

(4+3+3)

- 4A. Explain the steps involved in GSM signal processing with necessary diagrams.
- 4B. Assume a discrete channel impulse response is used to model urban RF radio channels with excess delays as large as 100 μ s and microcellular channels with excess delays no larger than 4 μ s. If the number of multipath bins is fixed at 64, find (a) $\Delta \tau$ (b) the maximum RF bandwidth which the SMRCIM models can accurately represent.
- 4C. Draw the block diagrams of Channel Modulation Process in CDMA Digital Cellular Standard (IS-95).

(4+3+3)

- 5A. Draw the LTE architecture and mention the features of each element.
- 5B. Explain the functioning of Mobile IP protocol to support mobility in cellular systems.
- 5C. Explain the functioning of a RAKE receiver and justify its need in CDMA system.

(4+3+3)