Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

SIXTH SEMESTER B.Tech. (E & C) DEGREE END SEMESTER EXAMINATION
APRIL 2018
SUBJECT: MOBILE COMMUNICATION (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 shows how a call to a mobile user initiated by a landline subscriber is established.

1B. Draw the GSM architecture. Briefly mention the functions of each block.

1C. A CDMA 2000 radio has a receiver thermal noise floor of -108 dBm and the minimum signal-to-noise ratio to detect the signal is 5 dB. Find the receiver sensitivity.

(5+3+2)

2A. i) An MS is located 5 km away from a BS and uses a vertical λ/4 monopole antenna with a gain of 2.55 dB to receive cellular radio signals at carrier frequency of 900 MHz. The E-field at 1 km from the Tx is measured to be 10^{-3} V/m. Find the received power at the mobile using the 2-ray ground reflection model assuming the height of the Tx antenna is 50 m and the receiving antenna is 1.5 m above ground.

ii) If 25 watts is applied to a Tx antenna with unity gain at 900 MHz carrier frequency, find the received power in dBm at a free space distance of 100 m from the antenna. Find the received power at 5 km by a unity gain Rx antenna.

2B. Design a cellular system that supports users, who travel in high speed vehicles and pedestrians. Show relevant diagrams.

2C. A cellular phone has a 3900mAH battery. Assume that the cellular phone draws 0.3mA in an idle mode and 30 mA during a call. What is the battery life in (in hours) if the user makes a 10-min call every hour?

(5+3+2)

3A. i) Mention the features of Okumura outdoor model with necessary equations. Also mention its disadvantages.

ii) Derive the channel impulse response of a Mobile radio channel.

3B. A cellular system of 32 Cells with a cell radius of 1.6 km, a total 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 no. of concurrent calls that can be handled?

3C. How to determine the quality of a cellular channel? Mention how this helps in deciding the handoff procedures.

(5+3+2)

4A. Classify the GSM channels and explain about each classification in detail with relevant diagrams.

4B. The urban RF radio channels are as a discrete channel impulse response with maximum excess delays as 32μs and microcellular channels with maximum excess delay as 2μs. If the number of multipath bins is fixed at 128, find (a) $\Delta\tau$, (b) the maximum RF BW which the SMRCIM models can accurately represent.

4C. Find C/I for a worst case user in a 7-cell cluster size cellular system having n=4. Comment on C/I and capacity effect if the cluster size is increased.

(5+3+2)

5A. Write about any five proposals to modify TCP for supporting in mobile environments.

5B. Explain the steps in GSM signal processing with relevant diagrams.

5C. A user gets assigned one-time slot per GSM frame with the achieved data rate of 22.8 Kbps. What would be the user data rate if the 2 flag bits and the 6 tail bits were converted to data symbols.

(5+3+2)