Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

VI SEMESTER B.TECH. (COMPUTER AND COMMUNICATION ENGINEERING)

END SEMESTER EXAMINATIONS, APRIL/MAY 2019

SUBJECT: WIRELESS COMMUNICATION AND COMPUTING [ICT 3251]

REVISED CREDIT SYSTEM

(25/04/2019)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data if any, may be suitably assumed.

1A. A wireless sensor network is deployed in a forest environment. Sensors are deployed in various places to measure humidity, temperature and wind levels. A trigger circuit is deployed which raises an alarm if the read values increase a certain threshold. For the network scenario given above, identify suitable routing algorithm(s). Justify your answer and illustrate the working of the same. **5**

1B. Explain the methods used in OFDM to combat ISI effect and maintain spectral efficiency over wireless channels. **3**

1C. Compute the total number of users (voice channels) supported for the following scenarios:

i. An AMPS uplink system having total bandwidth of 100 MHz, per channel bandwidth of 60 kHz and guard band of 10 kHz, out of which 21 channels are used for control information.

ii. A CDMA system with 3 sectors and voice activity factor of 3/8 having total bandwidth of 1.75 MHz, bit rate of 9.6 kbps and minimum acceptable S/I from other users to be 9dB. **2**

2A. List and explain in brief the various transmission impairments observed during wireless communication. A mobile station traveling at a speed of 60 km/h transmits at 900 MHz. If it receives or transmits data at a rate of 64 kbps, is the channel fading slow or fast? For the same data rate if the delay spread is $\tau d = 2\mu$ sec, calculate the coherence bandwidth and show if the channel undergoes flat or frequency selective fading. **5**

2B. Describe the basic components of GSM system and the additional components due to GPRS addition along with their functions. **3**

2C. Define the following terms related to MIMO

i. Outage capacity

ii. Cyclic Delay Diversity **2**

3A. Identify the type of handovers in the following scenarios :

i. Between 2 GSM systems
ii. Between 2 CDMA systems
iii. Inter-RAT handover
iv. Inter-sector handover

A mobile system is moving from Base Station 1 to Base Station 2 at a speed of 100 km /hr. The distance between the base stations is D = 2000 m. Assuming the minimum usable signal level for acceptable voice quality at the base station receiver is –88 dBm, path loss exponent to be 2.9 and the time required to complete the handoff is 4.5 sec, compute the minimum required margin for handoff and comment on the effect of the obtained margin on the performance of cellular systems. [Assume d0 =1 P0=0dBm] **5**

3B. Explain the steps involved in principles of Interweaving in Hierarchical model of Dynamic Spectrum Access. Why is it necessary to incorporate these steps? **3**

3C. Identify the GSM logical channel performing the following operations :

i. Broadcast location area identity
ii. Receive access request from mobile station for call set up
iii. Transfer information about the TDMA frame structure in a cell
iv. Transmit messages to indicate an incoming call. **2**

4A. What are the various approaches employed in MIMO for antenna selection. Compute the value of channel capacity for the following systems, if SNR = 12 dB and 1MHz signal is transmitted. (Take number of transmitting antennas = number of receiving antennas = 4)

i. SIMO
ii. SISO
iii. MIMO
iv. MISO **5**

4B. With a neat state diagram explain the various states which mobile station undergoes during location management in GPRS. Also differentiate between intra-SGSN and inter-SGSN routing area updates. **3**

4C. Trunking radio systems are an important variant of cellular phones. What are the technical innovations present in trunking radio which are not present in cellular phones? **2**

5A. Explain the cause of interference in frequency, time, code and space domains. What are the countermeasures incorporated in FDMA, TDMA, CDMA and SDMA to prevent interference? **5**

5B. If 24MHz of the total spectrum is allocated for duplex cellular communication which uses two 25kHz to support voice and control information, find the total number of channels and number of channels per cell site if N=4. Comment on the observation made. Also further explain how coverage and capacity in cellular systems can be improved in urban areas. **3**

5C. Differentiate between

i. Overlay and Underlay spectrum access strategies of Cognitive Radio
ii. Blank & Burst traffic and Dim & Burst modes of CDMA **2**