Reg. No.									

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

II SEMESTER M.TECH. (COMPUTER NETWORKING AND ENGINEERING / SOFTWARE ENGINEERING)

END SEMESTER EXAMINATIONS, APRIL/MAY-2019

SUBJECT: PROGRAM ELECTIVE III – ADVANCED TELECOMMUNICATION TECHNOLOGIES [ICT 5231]

REVISED CREDIT SYSTEM
(04/05/2019)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

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

1A. Draw the protocol architecture of LTE – EPC model and enumerate all protocols. **5**

1B. Calculate the bandwidth saving that can be achieved by the network service provider in an area when OFDM is used instead of FDM with 5 KHz guard band spacing. Given that: total available bandwidth of 20 MHz is distributed among 3 cells (frequency re-use factor is 3), such that each cell can support 100 subscribers and each subscriber gets a bandwidth of 20 KHz. **3**

1C. Analyze the graph shown in Figure Q.1C and justify your conclusion drawn with valid reasons.

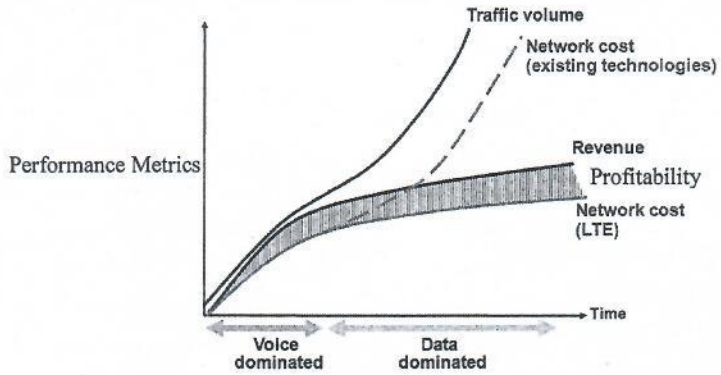

Figure Q.1C **2**

2A. Explain the OFDM radio access frame structure of LTE network using suitable diagrams and prove that the theoretical and effective throughput for FDD downlink data channel are 67.2 Mbps and 50.4Mbps respectively with QPSK modulation scheme, operating bandwidth of 20MHz, (100 Physical Resource Blocks) , 2 X 2 MIMO arrangement and assuming 4,200,000 resource elements are reserved for reference signals. **5**

2B. The mobility of the subscriber device must be hidden in a Wi-MAX network. Justify the above statement with supportive statements and method (procedure) to achieve the same. **3**

2C. Differentiate between the control plane and data plane QoS mechanisms in WiMAX network. 2

3A. Explain downlink and uplink channel structure defined in LTE technology with neat diagram. 5

3B. Describe following techniques and their usage in the context of LTE network using suitable examples. 3

i) Diversity Techniques

ii) Beam forming Techniques

3C. Explain how Hybrid ARQ scheme is used in the Medium Access Control (MAC) layer for fast reporting and retransmission. 2

4A. Illustrate with a neat diagram the initial attach procedure with GUTI for a known UE in LTE network. 5

4B. Compare and contrast the two methods of making voice call in LTE. 3

4C. Why does the 802.16 support both FDD and TDD mode of operation? Explain with suitable diagram. 2

5A. Compute the link margin for a fixed desktop in outdoor scenario (both uplink and downlink direction) of WiMAX using the parameters as given in Table Q.5A. 5

5B. Explain the distinguishing features and its functionalities introduced in 802.16e to reduce the power consumption during the long period of inactivity. 3

5C. Differentiate between multipath fading and shadowing effects in wireless communication 2

Table Q.5A.

Parameter	Downlink channel	Uplink Channel
Power amplifier output power	43 dB	27 dB
Number of Tx antennas	2	1
Power amplifier backoff	0.5 dB	0.5dB
Transmit antenna gain	18 dBi	6 dBi
Transmitter losses	3 dB	0
Channel bandwidth	10 MHz	10 MHz
Number of subchannels	16	16
Receiver noise figure	8 dB	4 dB
Required SNR	0.8 dB	1.8 dB
Data rate per subchannel	151.2 kbps	34.6 kbps
Receiver antenna gain	6 dBi	18 dBi
Shadow-fade margin	10 dB	10 dB
Building penetration loss	10 dB	10 dB