

**MOBILE COMMUNICATION-3G AND ABOVE
(ECEN 4247)**

Time Allotted : 2½ hrs

Full Marks : 60

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
any 4 (four) from Group B to E, taking one from each group.*

Candidates are required to give answer in their own words as far as practicable.

Group – A

1. Answer any twelve:

12 × 1 = 12

Choose the correct alternative for the following

- (i) Dynamic channel assignment is mainly done to take care of
 - (a) Decrease transmit power
 - (b) Increase gain level
 - (c) Decrease in traffic capacity
 - (d) Increase in traffic capacity
- (ii) Determine no of cells in cluster when $i=2$ and $j=4$
 - (a) 7
 - (b) 14
 - (c) 28
 - (d) 35
- (iii) How much increase in spectral efficiency is provided by W-CDMA in comparison to GSM?
 - (a) Two times
 - (b) Three times
 - (c) No increase
 - (d) Six times
- (iv) What type of multiple access technology is used in the UMTS Terrestrial Radio Access Network (UTRAN)
 - (a) FDMA (Frequency Division Multiple Access)
 - (b) TDMA (Time Division Multiple Access)
 - (c) CDMA (Code Division Multiple Access)
 - (d) OFDMA (Orthogonal Frequency Division Multiple Access)
- (v) What is one of the major challenges in 4G networks?
 - (a) High latency
 - (b) Efficient spectrum management
 - (c) Low data rate
 - (d) Lack of wireless communication
- (vi) Which of the following is a key feature of 4G networks
 - (a) Circuit-switched technology
 - (b) Packet-switched technology
 - (c) Limited bandwidth
 - (d) Low data rates
- (vii) BLAST technology aims to improve wireless communication performance by
 - (a) Reducing bandwidth requirements
 - (b) Utilizing multiple antennas at both the transmitter and receiver
 - (c) Simplifying signal processing
 - (d) Decreasing power consumption

- (viii) Which LTE channel is used for carrying control information?
 (a) PDSCH (b) PDCCH (c) PHICH (d) PBCH
- (ix) Which of the following is NOT a feature of LTE-Advanced?
 (a) Heterogeneous Networks
 (b) Multimode terminals and intersystem handover
 (c) Circuit-switched core network integration
 (d) Relays for enhanced coverage.
- (x) What is the main characteristic of a HetNet ?
 (a) Deployment of only macro cells
 (b) Deployment of a mix of macro cells, small cells (pico, femto), and relay nodes
 (c) Use of a single frequency band
 (d) Simple network management.

Fill in the blanks with the correct word

- (xi) _____ is the major concern in frequency reuse.
- (xii) MIMO technology in 4G networks improves_____.
- (xiii) Hybrid ARQ is part of the _____ layer.
- (xiv) In CDMA2000, EV-DO stands for _____.
- (xv) In the context of LTE-Advanced HetNet stand for _____.

Group - B

2. (a) What do you mean by Co-Channel Interference and Hand-off?
 [(CO1)(Understand/LOCQ)]
- (b) 40 MHz bandwidth is allocated to a FDD cellular system which uses two 20kHz simplex channels to provide full duplex operation. Compute the number of channels available per cell if a system uses a) 4 cell reuse b) 7 cell reuse c) 12 cell reuse.
 [(CO1)(Evaluate/HOCQ)]
- (c) Justify how umbrella-cell approach improves the quality of service in cellular system.
 [(CO1)(Analyze/IOCQ)]
3 + 6 + 3 = 12
3. (a) Increasing the frequency –reuse factor of a cellular system, increases the capacity as well as the co-channel interference of a cellular system. Justify.
 [(CO2)(Analyse/HOCQ)]
- (b) Why is downlink frequency always kept higher than the uplink frequency in cellular communication system?
 [(CO2)(Analyse/HOCQ)]
- (c) Explain the call setup procedure of GSM network.
 [(CO2)(Remember/LOCQ)]
4 + 4 + 4 = 12

Group - C

4. (a) Frequency planning is not required in CDMA networks. Justify the statement.
 [(CO3)(Analyse/IOCQ)]

- (b) Explain near-far problem of CDMA and the ways to mitigate the same. [[C03](Remember/LOCQ)]
- (c) Differentiate between soft-handoff and hard-handoff in CDMA. [[C03](Analysis/IOCQ)]
- 3 + 5 + 4 = 12**
5. (a) Briefly describe the role of the Serving GPRS Support Node (SGSN) and Gateway GPRS Support Node (GGSN) in the UMTS core network. [[C03](Remember/LOCQ)]
- (b) How does HSDPA improve downlink data rates in UMTS? [[C03](Analysis/IOCQ)]
- (4 + 4) + 4 = 12**

Group - D

6. (a) Explain Long Term Evolution. How OFDM improves the performance of 4G LTE System? [[C04, C05](Analyze/IOCQ)]
- (b) What is VoLTE? How does VoLTE work? [[C04](Understand/LOCQ)]
- 6 + (2 + 4) = 12**
7. (a) What are the key features that distinguish 4G networks from 3G networks. [[C04, C06](Analyze/IOCQ)]
- (b) Describe two major challenges faced by 4G network operators. [[C04, C06](Remember/LOCQ)]
- (c) Explain the concept of "packet-switched" core network in 4G. [[C04](Analyze/IOCQ)]
- 4 + 4 + 4 = 12**

Group - E

8. (a) What is a Heterogeneous Network (HetNet) in LTE-Advanced? What are the different types of cells typically found in a HetNet? [[C05](Remember/LOCQ)]
- (b) What are the benefits of deploying HetNets in LTE-Advanced? [[C05](Analysis/IOCQ)]
- (c) Explain the concept of cell selection and handover in a HetNet environment. [[C04, C06](Analysis/IOCQ)]
- (2 + 2) + 3 + 5 = 12**
9. (a) Explain the concept of Coordinated Multi-Point (CoMP) and its role in improving cell-edge performance. [[C05, C06](Analyze/IOCQ)]
- (b) How do small cells contribute to improved network capacity and coverage in HetNets? [[C05](Remember/LOCQ)]
- (c) What are the main performance targets of 5G networks in terms of data rates, latency, and connection density? [[C05, C06](Analyze/IOCQ)]
- 4 + 4 + 4 = 12**

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	39.58	45.84	14.58

