

**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) Which one of the following is a type of wireless communication?
(a) LAN (b) WAN (c) PAN (d) All of these.
- (ii) UMTS use which multiple access technique?
(a) CDMA (b) TDMA (c) FDMA (d) SDMA.
- (iii) Space diversity is also known as
(a) frequency diversity (b) antenna diversity
(c) polarization diversity (d) time diversity.
- (iv) The difference between the GSM SIM and USIM is that
(a) USIM is downloadable and can be accessed via air interface and modified by the network
(b) It can store java application
(c) Higher capacity than GSM SIM
(d) All of these.
- (v) Which of the following is the drawback for cordless telephones?
(a) Security (b) Wireless Technology
(c) Limited coverage area (d) Mobile.
- (vi) Which two channels are responsible for initiating mobile calls?
(a) FCC & RVC (b) FVC & FCC (c) FVC & RVC (d) FCC & RCC
- (vii) Which organization is responsible for developing LTE standards?
(a) UMTS (b) 3GPP (c) 3GPP2 (d) ISO
- (viii) Which of the following is not a part of the characteristic of 4G network?
(a) Multi-rate management (b) Fully converged services
(c) Software dependency (d) Diverse user devices.

- (ix) What location management feature is supported by 4G?
 (a) Concatenated Location Registration (b) Concurrent Location Register
 (c) Concatenated Management (d) Collated Location Registration.
- (x) What is the carrier Bandwidth in a typical 3G WCDMA based network?
 (a) 1.4 MHz (b) 3 MHz (c) 5 MHz (d) 10 MHz.

Fill in the blanks with the correct word

- (xi) _____ is the major concern in frequency reuse.
- (xii) GPRS stands for _____.
- (xiii) OFDMA stands for _____.
- (xiv) Hybrid ARQ is part of the _____ layer.
- (xv) The full form of UMTS is _____.

Group - B

2. (a) What are the distinguishing features of 2G, 2.5G, 3G and 4G? *[[C02](Remember/LOCQ)]*
 (b) Explain the relative merits and demerits of large and small cluster size.
 Prove that $D/R = \sqrt{(3N)}$ *[[C12](Analyze/IOCQ)]*
6 + 6 = 12
3. (a) What are the different channel allocation schemes used in cellular communications? In which situations each of these schemes are suitable? *[[C01](Understand/LOCQ)]*
 (b) Explain Co channel and Adjacent channel interference. How it can be minimized? *[[C01](Analyze/IOCQ)]*
4 + 8 = 12

Group - C

4. (a) What are the features of 3G CDMA 2000 based system? Why is handoff in CDMA called soft one? Explain the process. *[[C03](Analysis/IOCQ)]*
 (b) What is near far problem in CDMA network? How can it be minimized? *[[C03](Explain/IOCQ)]*
6 + 6 = 12
5. (a) Explain the significance of RNC and Node B in UMTS network. *[[C03](Understand/LOCQ)]*
 (b) Performance of the UMTS network enhanced after adopting adapting modulation and coding. Justify this statement. *[[C03](Evaluate/HOCQ)]*
 (c) Why W-CDMA is the dominant transmission technology for 3G cellular systems? Explain. *[[C03](Analyze/IOCQ)]*
4 + 5 + 3 = 12

Group - D

6. (a) What are the features of 4G technologies that makes it attractive than other features? [[C03](Remember/IOCQ)]
(b) What are the challenges in designing a 4G network? [[C03](Remember/IOCQ)]
(c) How OFDM improves the performance of 4G LTE System. [[C03](Apply/IOCQ)]
4 + 4 + 4 = 12
7. (a) 2×2 DL Single-User MIMO Spatial Multiplexing (SU-MIMO) scheme doubles the downlink peak user data rate. Justify the statement with proper diagram. [[C04](Analysis/IOCQ)]
(b) What are the various challenges associated with the designing a 4G network? [[C04](Apply/IOCQ)]
8 + 4 = 12

Group - E

8. (a) LTE-Advanced significantly enhances the existing LTE release. Justify [[C05](Analyse/HOCQ)]
(b) What are the new functionalities which are introduced in LTE-Advanced network? [[C05](Remember/LOCQ)]
6 + 6 = 12
9. (a) Coordinated Multi-Point (CoMP) operation improves network performance at cell edges: justify the statement. [[C05,C06](Analysis/IOCQ)]
(b) How the carrier aggregation leads towards bandwidth enhancement in the LTE-Advanced system? [[C05](Apply/IOCQ)]
6 + 6 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	20.83	67.71	11.46

Course Outcome (CO):

After the completion of the course students will be able to

1. Recapitulate cellular communication systems, architecture, functioning, and various standards.
2. Learn evolution of mobile communication generations 2G, 2.5G
3. Learn 3G with their characteristics and limitations.
4. Understand emerging technologies required for fourth generation mobile systems such as SDR, MIMO etc.
5. Understand the concept of LTE-advanced, 4G features and challenges, 5G vision.
6. Analyse and compare architecture, functioning, protocols, capabilities and application of various mobile communication networks.

**LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question.*

