ECEN 4247

B.TECH/ECE/8TH SEM/ECEN 4247/2023

MOBILE COMMUNICATION 3G AND ABOVE (ECEN 4247)

Time Allotted : 3 hrs

1.

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

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

Group - A (Multiple Choice Type Questions)

Choose the correct alternative for the following:

(i)	UMTS use which (a) CDMA	multiple access te (b) TDMA	chnique? (c) FDMA	(d) SDMA.	
(ii)	A mobile communication system has an allocated number of 1000 voice channels. If the service area is divided into 20 cells with a frequency reuse factor of 4, the system capacity is				
(iii)	 (a) 1000 (b) 4000 (c) 5000 (d) 20000. What is the full form of UMTS? (a) Universal Mobile Telephone System (b) Ubiquitous Mobile Telephone System (c) Ubiquitous Mobile Telemetry System (d) Universal Machine Telemedicine System. 				
(iv)	Which RNC function is responsible : (a) Load Control (c) Micro Diversity		for allocation of bearer? (b) Admission Control (d) Resource Manager.		
(v)	What are the ave (a) 1-3 Mgps	erage upload speed (b) 2-5 Mgps	ls of our 4G LTE no (c) 1-3 Mbps	etwork? (d) 2-5 Mbps.	
(vi)	What is the Access technique used by an LTE or LTE-A network? (a) WCDMA (b) FDMA (c) PDMA (d) OFDMA.				
(vii)	What is the name of a Base Transceiver Station in 2G system equivalent in a 4G LTE system?				
	(a) NodeB	(b) ENodeB	(c) ANodeB	(d) NodeBPro.	
(viii)	Which organizati (a) UMTS	ion is responsible ((b) 3GPP	for developing LT (c) 3GPP2	E standards? (d) ISO.	

 $10 \times 1 = 10$

Full Marks: 70

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- What is the minimum spectrum allocation required by W-CDMA? (ix) (d) 200 kHz. (b) 20 MHz (c) 1.25 MHz (a) 5 MHz
- (x) Which network is smooth across heterogeneous networks? (d) UMTS. (a) CDMA2000 (b) GSM (c) GPRS

Group - B

2. (a) In a cluster, there is an increased subscriber density at a particular cell. Recommend a technique to adopt this enhanced traffic density. Also estimate the probable practical limitations in your proposal.

[(CO1,CO2)(Evaluate/HOCQ)]

- (b) Plan the channel allocation strategy of a cellular system to overcome problems [(CO1,CO2)(Evaluate/HOCQ)] which arise from adjacent cell interference? (4+2)+6=12
- 3. (a) Assess the influence of co-channel interference on system capacity of a cellular [(CO1,CO2)(Analyse/IOCQ)] system.
 - Develop a technique to enhance the capacity of the cellular system by reducing (b) co-channel interference without modifying the basic cell structure.

[(CO1,CO2)(Apply/IOCQ)] 6 + 6 = 12

Group - C

- (a) How modification in the Radio Access Network improves the performance of a 4. [(CO3)(Analyse/IOCQ)] 2.5G system?
 - Compare the operation of UE and Node B with the analogous component in the (b) [(CO3,CO6)(Analyse/IOCQ)] 2G system.
 - Mention the improvements in the performance achieved in HSDPA compared to (c) [(CO3,CO6)(Understand/LOCQ)] 3G Network.

4 + 4 + 4 = 12

5. What are the key differences between IS95 AND CDMA2000? (a)

[(CO2,CO3)(Remember/LOCQ)]

(b) Explain UMTS network operation with suitable figure.

Cdma2000-1xEV

[(CO3)(Understand/LOCQ)] advancement for high-data-rate is evolutionary an [(CO3)(Analyze/IOCQ)] applications. Justify this statement.

3 + 5 + 4 = 12

Group - D

Define Long Term Evolution. How OFDM improves the performance of 4G LTE 6. (a) [(CO4,C05)(Analyze/IOCQ)] System? What is VoLTE? How does VoLTE work? [(CO4)(Understand/LOCQ)] (b) 6 + 6 = 12

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(c)

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- 7. (a) Explain MIMO techniques. Explain the working principal of 2 × 2 DL Single-User MIMO Spatial Multiplexing (SU-MIMO) scheme.
 - (b) How Heterogeneous Networks in LTE can be deployed? Explain briefly.
 (CO4,CO5)(Evaluate/HOCQ)]

7 + 5 = 12

Group – E

- 8. (a) What are the significance of coordinated multipoint transmission and reception? How it is going to enhance network performance? [(CO5)(Analyze/IOCQ)]
 - (b) Explain the important features of 5G communication system. What are the key constraints to deploy 5G system under the existing infrastructure?

[(CO5,CO6)(Evaluate/HOCQ)] 6 + 6 = 12

- 9. (a) NOMA scheme exploits the channel gain difference between users to achieve high spectral efficiency. Justify the statement. [(CO5)(Analyse/LOCQ)]
 - (b) How the carrier aggregation leads towards bandwidth enhancement in the LTE-Advanced system? [(CO5)(Apply/IOCQ)]

4 + 8 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	22.92	53.13	23.96

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.