ECEN 4222

# B.TECH/IT/8<sup>TH</sup> SEM/ECEN 4222/2022

## CELLULAR AND MOBILE COMMUNICATION (ECEN 4222)

**Time Allotted : 3 hrs** 

Figures out of the right margin indicate full marks.

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

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

## Group – A (Multiple Choice Type Questions)

1.	Choos	10 × 1 = 10		
	(i)	Multiplexing is used in (a) packet switching (c) circuit switching	(b) data switching (d) none of these	
	(ii)	Which one is used as a mobile handset and (a) Omni-directional Antenna (c) Horn Antenna	tenna? (b) Microstrip Printed A (d) Yagi-Uda Antenna.	Antenna
	(iii)	Free Space Propagation Model is mathem (a) Log distance path model (c) Log normal model	atically represented by (b) Friis formula (d) Okumura Hata mod	el.
	(iv)	Soft hand-off is applicable for (a) CDMA cellular (c) both (a) and (b)	(b) GSM cellular (d) GPRS cellular.	
	(v)	Apparent shift in frequency in multipath between (a) base station and MSC (c) mobile and MSC	wave is caused due to a (b) mobile and surroum (d) mobile and base sta	relative motion ding objects ition.
	(vi)	LTE – the full form is (a) Long Term Evolution (c) Link Time Establishment	(b) Low Term Evaluation (d) none of these.	on
	(vii)	How many users or voice channels are s GSM? (a) Eight (c) Sixty four	upported for each 200 (b) Three (d) Twelve.	kHz channel in

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Full Marks: 70

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(viii)	The basic frequency regions for GSM is			
	(a) 900 MHz	(b) 1800 MHz		
	(c) 1900 MHz	(d) all the above.		

- (ix) Which of the following specifies a set of media access control (MAC) and physical layer specifications for implementing WLANs? (a) IEEE 802.16 (b) IEEE 802.3
  - (c) IEEE 802.11

(d) IEEE 802.15

(x) When we divide band of Orthogonal Frequency Division Multiplexing (OFDM) into sub bands, it diminishes effects of \_\_\_\_\_ (b) collision (a) noise (c) interference (d) signals absence.

# Group - B

- 2. What is Co-channel Interference in cellular system? How it can be minimized? (a) [(CO1,CO2),Analyze/IOCQ]
  - With suitable diagram explain the process of Hard Hand Off in cellular system? (b) [(CO1,CO2),Analyze/IOCQ]
  - Cell splitting is one of the methods of increasing capacity of cellular system. (c) Discuss the method of cell splitting and show how it helps to increase capacity when a large cell of radius R is split into smaller cell of radius R/4.

[(CO1,CO2),Evaluate/HOCQ] 4 + 3 + 5 = 12

3. Discuss the different mechanisms of multipath phenomena. (a)

[(CO1,CO2)(Analyze/IOCQ)]

- How is received power at the mobile station related with distance and path loss (b) [(CO3)(Analyze/IOCQ)] exponent?
- For an identical received power at the boundaries of original larger cell with (c) radius  $R_0$  and the new split cell with radius  $R_0/2$ , prove that the cell-site transmitter power of the split cell must be 12 dB less than the cell-site transmitter power of the original larger cell. Assume path-loss exponent as 4 in a typical mobile environment. Comment on the result obtained.

[(CO4)(Evaluate/HOCQ)] 3 + 2 + 7 = 12

# Group - C

What is the difference between GSM and CDMA network? (a) [(CO4)(Evaluate/HOCQ)] How call can be routed to a mobile subscriber from BTS in GSM network? (b) [(CO3)(Analyze/IOCQ)] Describe the GSM frame structure. Why is a guard band used in GSM frame? (c)

[(CO3)(Analyze/IOCQ)] 2 + 4 + (4 + 2) = 12

4.

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5. (a) Explain, with the help of a diagram, the GPRS network architecture

[(CO1,CO2)(Understand/LOCQ)]

- (b) What is WDM? What are the advantages in spread spectrum technology? [(CO1,CO2),Remember/LOCO]
- (c) Outline briefly the function of SGSN in GPRS network.

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[(CO1,CO2)(Analyze/IOCQ)]
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6 + 4 + 2 = 12

# Group - D

6. (a) Write down the basic features of CDMA IS-95 system.

[(CO2,CO3),Remember/LOCQ] How the forward and reverse channels are assigned in CDMA system.

(c) What would happen if there were no power control mechanisms in CDMA systems?
(CO2,CO3),Analyze/IOCQ]
(CO2,CO4,CO6),Evaluate/HOCQ]

4 + 4 + 4 = 12

7. (a) With suitable diagram explain LTE- network architecture.

[(CO4)(Remember/LOCQ)]

- (b) Why uplink frequency is greater than downlink frequency in LTE networks? Justify. [(CO4)(Analyze/IOCQ)]
- (c) What is the channel allocation strategy in UMTS system?

[(CO3)(Analyze/IOCQ)]

6 + 4 + 2 = 12

# Group - E

- 8. (a) What are the main functional entities for Mobile IP? What is triangular routing in mobile IPv4? [(C01,C05),Analyze/IOCQ]
  - (b) What are the design considerations in OFDMA system? Write down the differences between SC-FDMA and OFDMA. [(CO4,CO6),Analyze/IOCQ]

(3+3) + (3+3) = 12

- 9. Write short note on (any three):
  - (i) Channel assignment strategy in cellular system.
  - (ii) Near far problem in CDMA.
  - (iii) Channel structure of LTE 4G.
  - (iv) Tunnelling in Mobile IP.

[(CO1,CO3,CO4,CO5),Remember/LOCQ] 4 + 4 + 4 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	33.33	47.92	18.75

(b)

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#### **Course Outcome (CO):**

After completing the course the student will be able to:

- 1. Learn about the evolution of radio communication and fundamental design strategies of cellular network.
- 2. Appreciate the challenges of RF communication.
- 3. Understand the concepts of propagation over wireless channels.
- 4. Learn about the both physical and networking of LTE-4G systems.
- 5. Understand the functioning of IP technology.
- 6. Apply their knowledge for research work in communication domain.

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