

**ADVANCED COMMUNICATION SYSTEMS
(ECEN 4103)**

Time Allotted : 3 hrs

Full Marks : 70

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)**

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) The interference between the neighbouring base stations is avoided by _____
(a) Assigning different group of channels
(b) Using transmitters with different power level
(c) Using different antennas
(d) Using different base stations.
- (ii) The time over which a call is maintained within a cell without handoff is the
(a) settling time
(b) signalling time
(c) dwell time
(d) blank time.
- (iii) Free Space Propagation Model is mathematically represented by
(a) Log distance path model
(b) Friis formula
(c) Log normal model
(d) Okumura Hata model.
- (iv) Apparent shift in frequency in multipath wave is caused due to relative motion between _____
(a) Base station and MSC
(b) Mobile and surrounding objects
(c) Mobile and MSC
(d) Mobile and base station
- (v) How many users or voice channels are supported for each 200 KHz channel in GSM?
(a) Eight
(b) Three
(c) Sixty four
(d) Twelve.
- (vi) Soft hand-off is applicable for:
(a) CDMA cellular
(b) GSM cellular
(c) both (a) and (b)
(d) GPRS cellular.
- (vii) When we divide band of Orthogonal Frequency Division Multiplexing (OFDM) into sub bands, it diminishes effects of _____
(a) noise
(b) collision
(c) interference
(d) signals absence.

- (viii) First generation cellular was called hybrid as
(a) the traffic channel was digital and control channel was analog
(b) only the traffic channel was analog
(c) TDMA/FDMA was applied
(d) none of these.
- (ix) Every CDMA channel in any BTS is identified by
(a) an RF Carrier
(b) a pilot channel
(c) an RF carrier and a PN code
(d) a sync. Code.
- (x) The advantages of WiMAX:
(a) Scalable
(b) Low upgrade cost
(c) Wider coverage
(d) All of the above.

Group - B

2. (a) What are the important parameters that characterize frequency reuse? [[CO1,CO2][Remember/LOCQ]
(b) How are locations of co-channel cells determined in a cellular system, explain with pictorial representation. [[CO1,CO2] Analyze/IOCQ]
(c) Cell splitting is one of the methods of increasing capacity of cellular system. 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 + 4 + 4 = 12**
3. (a) Define hand-off process? What are the different types of handoff used in cellular communication, explain with suitable diagram? [[CO1,CO2][Remember/LOCQ]
(b) A base-transmitting antenna with unity gain produces 50 Watt of power. The operating frequency is 900MHz. A receiving antenna at the mobile station with gain 2 located at a distance 5 km from the base transmitter is used for the power reception. Calculate the received power at the mobile station using two-ray propagation model if the height of the base transmitter and mobile station are 40 m and 1 m respectively above the ground. [[CO1,CO2] Evaluate/HOCQ]
(c) Compared between fast fading and slow fading. [[CO1,CO2] Analyze/IOCQ]
- 4 + 4 + 4 = 12**

Group - C

4. (a) Discuss how spectrum allocation is done in a GSM cellular system? [[CO1,CO3],Analyze/IOCQ]
(b) What is the duration of a bit in a GSM system? If 8 voice channels are supported in each radio channel and there are no guard bands, then how many simultaneous users can be accommodated in a GSM system? [[CO3, CO6] Evaluate/HOCQ]
(c) How is a call routed to a GSM mobile? [[CO1,CO3], Analyze/IOCQ]
- 4 + 4 + 4 = 12**

5. (a) GPRS is the extension of GSM network. Explain. [[CO1,CO3], Analyze/IOCQ]]
(b) How are channels allocated for voice and data in GPRS network? [[CO3,CO6][Analyze/IOCQ]]
(c) What is direct sequence spread spectrum? How is it related to the number of subscribers in a CDMA network? [[CO3, CO6][Analyze/IOCQ]]

4 + 4 + 4 = 12

Group - D

6. (a) Differentiate between DCF and PCF in 802.11. How does RTS-CTS handshaking work? [[CO2, CO4, CO5][Analyze/IOCQ]]
(b) What are the features of CDMA based IS 95 system? Explain multi, super and hyper frames. [[CO2, CO5][Remember/LOCQ]]
(c) What would happen if there were no power control mechanisms in CDMA systems? [[CO2, CO4, CO6][Analyze/IOCQ]]

4 + 4 + 4 = 12

7. (a) What are the different frequency bands available for WiMAX standard? [[CO5][Remember /LOCQ]]
(b) Describe four features of an WiMAX system. [[CO5, CO6] [Remember/LOCQ]]
(c) What is OFDMA? How is the guard band related with multipath delay spread? [[CO5, CO6][Analyze/IOCQ]]

4 + 4 + 4 = 12

Group - E

8. (a) What are the challenges in seamless mobility in wireless environments? [[CO2,CO5][[Analyse/LOCQ]]
(b) What are the basic limitations of Mobile IPv4? [CO5 [[Analyse/LOCQ]]
(c) Show with the help of a neat diagram the Mobile IP operation. Explain briefly the 4 steps. [[CO5, CO5 [[Analyse/LOCQ]]

4 + 4 + 4 = 12

9. Write short notes on any three of the following: **(4 × 3) = 12**
(i) Doppler Effect
(ii) Dynamic Channel Allocation Strategy
(iii) Near-Far Problem in CDMA.
(iv) Triangular Routing. [CO2, CO3, CO4, CO5][Remember /LOCQ]

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	33.3 %	52.2%	12.5%

Course Outcomes (CO):

1. The students will learn about the evolution of radio communication.
2. They will be able to appreciate the challenges of RF communication.
3. Different wireless networks and their operations will be clear to them.
4. The students will learn about the new technologies like SDR and Cognitive radios.

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5. They will be able to understand the functioning of WI-FI networks.
6. Our students will be able to take up research work in communication domain.

Department & Section	Submission link:
ECE BACKLOG	https://classroom.google.com/c/NDU1MTY0NzI5MjI4?cjc=igipn7c