

**CELLULAR COMMUNICATION**  
**(ECEN 4125)**

**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) First generation cellular (1G) 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 (a), (b) & (c).
- (ii) In GSM system, the same pair of frequencies can be shared by
  - (a) An adjoining cell of same cluster
  - (b) Same cell number of an adjoining cluster
  - (c) Any cell of an adjoining cluster
  - (d) None of (a), (b) & (c).
- (iii) Which of the following is the drawback for cordless telephones?
  - (a) Wireless Technology
  - (b) Limited coverage area
  - (c) Mobile feature
  - (d) Security.
- (iv) In GSM, the uplink frequency is 880.0 MHz. The corresponding downlink frequency will be
  - (a) 930.5 MHz
  - (b) 925.0 MHz
  - (c) 860.5 MHz
  - (d) 880.5 MHz.
- (v) Free Space Propagation Model is mathematically represented by
  - (a) Log distance path model
  - (b) Friis formula
  - (c) Log normal model
  - (d) Okumura Hata model.
- (vi) Hexagon shape is assumed for radio coverage for a cell because of:
  - (a) Maximum coverage area
  - (b) Fewer number of cells
  - (c) Approximate circular radiation pattern
  - (d) All of the above.

- (vii) Capacity of a cellular system is increased in real time by
  - (a) Fixed channel assignment strategy
  - (b) Dynamic channel assignment strategy
  - (c) Cell splitting
  - (d) Frequency reuse.
- (viii) Which two channels are responsible for initiating mobile calls?
  - (a) FVC and FCC
  - (b) FVC and RVC
  - (c) FCC and RCC
  - (d) FCC and RVC.
- (ix) UMTS uses which multiple access technique?
  - (a) CDMA
  - (b) TDMA
  - (c) FDMA
  - (d) SDMA.
- (x) What is WISP?
  - (a) Wideband Internet Service Protocol
  - (b) Wireless Internet Service Provider
  - (c) Wireless Instantaneous Source Provider
  - (d) Wideband Internet Source Protocol.

*Fill in the blanks with the correct word*

- (xi) The bandwidth of GSM channels could be increased to 200 KHz as simultaneously, the concept of \_\_\_\_\_ was introduced in \_\_\_\_\_ multiple access scheme.
- (xii) In hard hand-off, the switching scheme employed is \_\_\_\_\_ .
- (xiii) The BTS performs the operation of \_\_\_\_\_ so that \_\_\_\_\_ can be maintained.
- (xiv) The Space diversity is also known as \_\_\_\_\_.
- (xv) \_\_\_\_\_ specifies a set of media access control (MAC) and physical layer specifications for implementing WLANs.

### Group - B

- 2. (a) What is frequency Reuse? Explain with diagram. [[CO1](Understand/LOCQ)]
  - (b) Analyse the need of various channel allocation strategies. [[CO2](Analyse/IOCQ)]
  - (c) Evaluate the expression  $D = R \sqrt{3N}$  in a cellular network. [[CO1](Evaluate/HOCQ)]
- 3 + 3 + 6 = 12**
- 3. (a) Define hand-off. Analyse its effect a call-in progression with proper diagram? [[CO2](Analyse/IOCQ)]
  - (b) What are the differences between hard and soft handoff? [[CO1](Remember/LOCQ)]
  - (c) Reflect on the impacts of multipath fading in radio propagation. [[CO2](Apply/IOCQ)]
- (4 + 2) + 4 + 2 = 12**

### Group - C

- 4. (a) Reflect on the need of the equalization in a communication process. Analyse the need of a RAKE Receiver. [[CO3](Analyse/IOCQ)]

- (b) If a normal GSM time slot consists of 6 trailing bits, 8.25 guard bits, 26 training bits and 2 traffic bursts of 58 bits of data, find the frame efficiency. [[CO4](Evaluate/HOCQ)]
- (c) Name the different interfaces in GSM architecture. [[CO2](Remember/LOCQ)]
- 4 + 6 + 2 = 12**
5. (a) Analyze the differences between pure aloha & slotted aloha with a proper diagram. [[CO3](Apply/IOCQ)]
- (b) Write down the features of FDMA. Why is the GSM defined as a FDMA/TDMA system? Explain. [[CO4](Remember/LOCQ)]
- (4 + 2) + 6 = 12**

### Group - D

6. (a) Draw and explain UMTS network architecture. [[CO3](Remember/LOCQ)]
- (b) Explain the choice of Uplink and Downlink frequency bands and allocation strategies for LTE networks. [[CO4](Analyse/IOCQ)]
- 6 + (2 + 2 + 2) = 12**
7. (a) Explain quadrature phase shift keying. Why is it termed as a quadrature method? [[CO3](Understand/LOCQ)]
- (b) Name some spread spectrum modulation techniques. Analyse their relative advantages and disadvantages. [[CO4](Analyse/IOCQ)]
- (2 + 4) + (3 + 3) = 12**

### Group - E

8. (a) Draw and explain the mechanism of triangular routing. [[CO5](Apply/IOCQ)]
- (b) What is the speciality of Bluetooth technology? Explain the need for introduction of Bluetooth technology in wireless communication. [[CO6](Evaluate/HOCQ)]
- 6 + 6 = 12**
9. (a) What are the basic entries of MIPv4? [CO5(Remember/ LOCQ)]
- (b) What are Tunneling and Reverse Tunneling? When are they used? [CO5(Understand/LOCQ)]
- (c) What are the major differences between SC-FDE and SC-FDMA? [CO5(Analyse/IOCQ)]
- 4 + 4 + 4 = 12**

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	36.45	44.80	18.75

#### Course Outcomes (CO):

- After the completion of the course the following outcomes are expected:
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 current multiplexing and modulation schemes.
5. They will be able to understand the functioning of internet protocols.
6. Our students will be able to take up research work in communication domain.

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