WIRELESS AND CELLULAR COMMUNICATION
(ECEN 3211)

Time Allotted : 3 hrs   **Full Marks : 70**

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. Choose the correct alternative for the following: **10 × 1 = 10**

    (i)   The concept of MAHO is applicable in
         (a) IG analog cellular system   (b) Base station antennas
         (c) 2G cellular system   (d) None of these.

    (ii)   Which modulation scheme is used by Bluetooth?
         (a) GFSK   (b) DQPSK
         (c) BPSK   (d) MSK.

    (iii)   In small scale fading random fluctuation in signal strength is observed for
         (a) large period of time   (b) small period of time
         (c) moderately high period of time   (d) none of the above.

    (iv)   A full-duplex communication is _____ way communication.
         (a) single   (b) two
         (c) multiple   (d) all the above

    (v)   GPRS stands for _____
         (a) Geo Packet Radio Receiver   (b) General Packet Radio Receiver
         (c) Gradient Packet Radio Receiver   (d) None of these.

    (vi)   Co-channel reuse ratio (Q) is
         (a) $3\sqrt{N}$ (b) $\sqrt{3N}$
         (c) $\sqrt{N/3}$ (d) $\sqrt{3/N}$

    (vii)   In GPRS architecture PCU logically associated with
         (a) BTS   (b) BSC
         (c) MSC   (d) GMSC.

    (x)   Determine no of cells in cluster when i=2 and j=4
         (a) 7   (b) 14
         (c) 28   (d) 35.

(viii)   In a mobile IP concept
(a) CSMA/CD is used
(b) MS remain attached to internet while roaming
(c) Data is scrambled
(d) None of these.

(ix)   Every CDMA channel in any BTS is identified by
(a) An RF Carrier
(b) An RF carrier and a PN code
(c) A sync. code
(d) A pilot channel.

Group- B

2.   (a)   Classify channel assignment strategies and explain briefly.
[(CO1)(Understand/LOCQ)]
(b)   Express signal-to-interference ratio in terms of co-channel reuse ratio for a single tier of co-channel cell.   [(CO1)(Understand/LOCQ)]
(c)   MAHO is a better technology compared to MSC supervised handoffs. Justify.
[(CO1)(Analyze/IOCQ)]
4 + 6 + 2 = 12

3.   (a)   Explain umbrella-cell approach.   [(CO1)(Understand/LOCQ)]
(b)   40 MHz bandwidth is allocated to a FDD cellular system which uses two 20kHz simplex channels to provide full duplex operation. Compute the number of channels available per cell if a system uses a) 4 cell reuse b) 7 cell reuse c) 12 cell reuse.   [(CO1)(Evaluate/HOCQ)]
(c)   Increasing the frequency –reuse factor of a cellular system, increases the capacity as well as the co-channel interference of a cellular system.
[(CO1)(Analyze/IOCQ)]
3 + 6 + 3 = 12

Group - C

4.   (a)   Describe the major functionalities of MSC. Why is GMSC needed in GSM architecture?   [(CO3)(Understand/LOCQ)]
(b)   How the authentication and security operations are maintained in GSM networks?   [(CO3)(Apply/IOCQ)]
(c)   Explain attach detach procedures with pictorial representation of GPRS network.   [(CO3)(Remember/LOCQ)]
(4 + 2) + 3 + 3 = 12

5.   (a)   Explain the call setup procedure of GSM network.   [(CO3)(Apply/IOCQ)]
(b)   Explain the GSM multi frame structure with suitable diagram.
[(CO3)(Remember/LOCQ)]

(c)   What is the difference between broadcast control channel and common control channel?   [(CO3, CO4)(Analyse/IOCQ)]

5 + 4 + 3 = 12

Group - D

6. (a)   Frequency planning is not required in CDMA networks. Justify the statement.
                                             [(CO4,CO6)(Evaluate/HOCQ)]
    (b)   Why downlink frequency is always kept higher than the uplink frequency in cellular communication system?   [(CO3)(Analyse/IOCQ)]
    (c)   Explain the Forward link of CDMA based IS-95 system. [(CO1)(Remember/LOCQ)]

3 + 4 + 5 = 12

7. (a)   Explain near-far problem of CDMA and the ways to mitigate the same.
                                             [(CO3)(Understand/LOCQ)]
    (b)   Differentiate between soft-handoff and hard-handoff in CDMA.
                                             [(CO3)(Analyze/IOCQ)]

(3 + 3) + 6 = 12

Group – E

8. (a)   Explain the two different topologies of Bluetooth.   [(CO5)(Understand/LOCQ)]
    (b)   Differentiate between MIPV4 and MIPV6?   [(CO5)(Analyze/IOCQ)]
    (c)   Explain triangular routing with the help of diagram. [(CO5)(Understand /LOCQ)]

4 + 4 + 4 = 12

9. (a)   Explain the salient feature of IEEE 802.11g and IEEE 802.11n.
                                             [(CO3)(Remember/LOCQ)]
    (b)   Draw the WLAN architecture & explain the major design components.
                                             [(CO3)(Apply/IOCQ)]
    (c)   What are the basic concept and functionality of a Mobile IP network?
                                             [(CO5)(Understand/LOCQ)]

3 + 6 + 3 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	53.12	37.5	9.38

Course Outcome (CO):

After the completion of the course students will be able to
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