WIRELESS AND MOBILE COMMUNICATION
(ECE5102)

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) Hexagon shape is used for radio coverage for a cell because of
(a) Maximum coverage area (b) Fewer number of cells
(c) Approximate circular radiation pattern (d) All the above

(ii) 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

(iii) In a cellular system, guard bands are used to _____
(a) Reduce frequency reuse
(b) Minimize adjacent channel interference
(c) Increase bandwidth efficiency
(d) Reduce propagation delay

(iv) GPRS network evolved in
(a) 2G (b) 2.5G
(c) 3G (d) 4G

(v) The major function of MSCs are
(a) Switching (b) Handoff
(c) Call handling (d) All of these

(vi) Free Space Propagation Model is mathematically represented by
(a) Log distance path model (b) Friis formula
(c) Log normal model (d) Okumura Hata model

(vii) Fixed WiMAX provides
(a) multipoint to multipoint technology (b) Multipoint to point technology
(c) Point to multipoint technology (d) (b) or (c)

(viii) 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

(ix) TCP/IP layer is equivalent to combined Session, Presentation and _____
(a) Network layer (b) Application layer
(c) Transport layer (d) Physical layer

(x) The tunneling mechanism in Mobile IP is used to
(a) Encrypt packets (b) Deliver packets to care-of address
(c) Reduce transmission delay (d) Increase bandwidth efficiency

Fill in the blanks with the correct word

(xi) Soft hand-off is applicable for _____ cellular network.

(xii) IEEE 802.11 sets standard for _____ to support high speed data communication.

(xiii) In mobile computing, HLR is the abbreviated as _____.

(xiv) The capacity of a cellular system can be increased by cell _____.

(xv) The CDMA technique is based on _____ spectrum.

Group - B

2. (a) Why is the phenomenon termed as "make-before-break" for GSM network. Why is handoff in CDMA called soft one? *[(CO2)(Analyse/IOCQ)]*
(b) What is Co-channel Interference in cellular system? How it can be minimized? *[(CO1, CO2)(Remember/LOCQ)]*
(c) How does the microcell zone concept improve capacity of cellular system? *[(CO1, CO2)(Create/HOCQ)]*

(2 + 2) + (2 + 2) + 4 = 12

3. (a) What are the important parameters that characterize frequency reuse? What is Software defined Antenna? *[(CO1)(Understand/LOCQ)]*
(b) For the given path loss n=3, find the frequency reuse factor and the cluster size that should be used for maximum capacity. The minimum signal to interference ratio required is 15dB. *[(CO1, CO2)(Create/HOCQ)]*
(c) Explain the concept of dwell time. Why is it important in handoff decisions? *[(CO1)(Remember/LOCQ)]*
(d) Differentiate between fixed channel assignment and hybrid channel assignment. *[(CO1)(Remember/LOCQ)]*

(2 + 2) + 3 + 3 + 2 = 12

Group - C

4. (a) Discuss how spectrum allocation is done in a GSM cellular system? *[(CO1, CO3)(Analyse/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)(Evaluate/HOCQ)]*

(c) Discuss the evolution from GPRS to EDGE and highlight their key features. *[(CO2, CO3)(Remember/LOCQ)]*

4 + 4 + 4 = 12

5. (a) A spectrum of 30 MHz is allocated to a wireless FDD cellular system which uses two 25 KHz simplex channels to provides full duplex voice and control channels. Compute the number of channels available per cell if a system uses 4 cell reuse. Also repeat the computation for 12 cell reuse. If 1 MHz of the allocated spectrum is dedicated to control channels, determine an equitable distribution of control channels and voice channels in each cell for each of the three system. *[(CO3)(Evaluate/HOCQ)]*

(b) What is the role of authentication in GSM? Explain the function of AuC. *[(CO3)(Create/HOCQ)]*

(c) What is the need for power control mechanisms in CDMA systems? *[(CO1, CO3)(Apply/IOCQ)]*

4 + 4 + 4 = 12

Group - D

6. (a) What do you mean by multipath phenomena in wireless communication? What are the factors that contribute to the rapid fluctuations of the signal amplitude? *[(CO1, CO2)(Analyse/IOCQ)]*

(b) Derive an expression for Free space propagation model considering a clear and undisturbed LOS path between the transmitter and receiver. *[(CO1, CO2)(Remember/LOCQ)]*

(c) If the received power at a reference distance d_0 = 1 km is equal to 1 μwatt, find the received power at distances of 8 km from the same transmitter using exact expression for two-ray ground reflection model. Given height of transmitting antenna is h_t = 40 m, receiving antenna h_r = 3m, $G_t = G_r$ = 0 dB, operating frequency f = 1800MHz. *[(CO2)(Evaluate/HOCQ)]*

4 + 4 + 4 = 12

7. (a) With relevant diagrams explain Rake receiver. Also explain how time diversity is achieved in CDMA using Rake receiver. *[(CO2n CO3, CO6)(Analyse/IOCQ)]*

(b) Obtain the principles of maximum ratio combining and equal gain combining. *[(CO1, CO2, CO6)(Remember/LOCQ)]*

(c) Why is CSMA/CD not suitable for wireless networks? How does use of RTS and CTS help in avoiding collisions. *[(CO4)(Apply/IOCQ)]*

(d) Draw and explain the basic architecture of WLAN. What are the different physical layers defined in 802.11b? *[(CO4)(Apply/IOCQ)]*

4 + 2 + 3 + 3 = 12

Group - E

8. (a) Define Home Agent and Foreign agent in MIP network? *[(CO5, CO6)(Remember/LOCQ)]*

(b) Explain the working of DSR (Dynamic Source Routing) protocol.

[(CO5, CO6)(Analyse/IOCQ)]

(c) Compare proactive and hybrid routing protocols in MANETs.

[(CO5, CO6)(Remember/LOCQ)]

4 + 4 + 4 = 12

9. (a) What are the main challenges in transport protocols for MANETs?

[(CO5, CO6)(Analyse/IOCQ)]

(b) Differentiate between traditional TCP and split TCP in mobile environments.

[(CO5, CO6)(Remember/LOCQ)]

(c) Describe briefly the tunneling and reverse tunneling operations in a mobile IP.

[(CO5, CO6)(Analyse/IOCQ)]

4 + 4 + 4 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	36.46	39.58	23.96