

**WIRELESS AND MOBILE COMMUNICATION
(ECEN 5102)**

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) The time over which a call is maintained within a cell without handoff is the
 - (a) Settling time
 - (b) Dwell time
 - (c) Signalling time
 - (d) Blank time
- (ii) 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.
- (iii) What is the minimum spectrum allocation required by W-CDMA?
 - (a) 5 MHz
 - (b) 20 MHz
 - (c) 1.25 MHz
 - (d) 200 MHz
- (iv) 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.
- (v) In a GSM network, the unit that facilitates roaming is called
 - (a) HLR
 - (b) EIR
 - (c) AuC
 - (d) VLR
- (vi) Inter symbol interference is characterised by
 - (a) delayed replica of previous symbol
 - (b) interference due to other mobiles
 - (c) uncorrelated symbols
 - (d) none of these.
- (vii) Which of the following is not an effect caused by multipath in radio channel?
 - (a) Rapid changes in signal strength
 - (b) Random frequency modulation
 - (c) Power of base station
 - (d) Time dispersion.
- (viii) Fading is caused due to
 - (a) Multipath propagation
 - (b) Obstacles
 - (c) Variation of amplitude and phase at receiver
 - (d) all of these.

- (ix) Which of the following protocols uses both TCP and UDP?
 (a) FTP (b) SMTP (c) Telnet (d) DNS.
- (x) A 4G communication supports the data rates of _____.
 (a) 200 Mbps (b) 1024 Mbps
 (c) 100 Mbps (d) 9.6 Mbps

Fill in the blanks with the correct word

- (xi) _____ number of users or voice channels is supported for each 200 KHz channel in GSM.
- (xii) LTE – the full form is _____.
- (xiii) IS-95 stands for _____.
- (xiv) The operating frequency for Bluetooth is _____.
- (xv) The main function of the snooping TCP is _____.

Group - B

2. (a) Explain mobility management and location management in cellular network.
[[CO1, CO2, CO6](Analyse/IOCQ)]
- (b) How is signal to interference ratio (S/I) related with frequency reuse ratio Q?
[[CO1, CO2](Analyse/IOCQ)]
- (c) Discuss the effects of the path loss exponent on the frequency reuse for a cellular system with total of 550 duplex voice channels without frequency reuse. The service area is divided into 152 cells. The required signal-to-co-channel interference ratio is 17 dB. Consider the path loss exponent η equal to 3, 4, and 5, respectively. Also determine (i) The cell cluster size, (ii) The number of cell clusters in the service area, and (iii) The maximum number of users in service at any instant.
[[CO1, CO2](Evaluate/HOCQ)]
4 + 4 + 4 = 12
3. (a) With suitable diagram explain the process of Hard Hand Off in cellular system.
[[CO1, CO2](Analyse/IOCQ)]
- (b) What do you mean by Universal mobile telecom system (UMTS) Release 99 technology?
[[CO1, CO6](Remember/LOCQ)]
- (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, CO6](Create/HOCQ)]
4 + 4 + 4 = 12

Group - C

4. (a) How is a call routed to a GSM mobile? What is the functionality of VLR in GSM networks?
[[CO3](Analyse/IOCQ)]
- (b) GPRS is the extension of GSM network. Explain with diagram. [[CO3](Remember/LOCQ)]

- (c) If a normal GSM time slot consists of six training bits, 8.25 guard bits 26 training bits, and two traffic bursts of 58 bits of data, find the frame efficiency.

[[CO3](Evaluate/HOCQ)]

$$(3 + 2) + 4 + 3 = 12$$

5. (a) How are GPRS attach and detach procedure initiated during GPRS mobility management? [[CO3](Analyse/IOCQ)]
- (b) What is near far problem in CDMA? What is the need for power control in CDMA? [[CO2, CO3](Remember/LOCQ)]
- (c) Explain the forward link of CDMA based IS-95 system. [[CO3](Apply/IOCQ)]

$$4 + (3 + 2) + 3 = 12$$

Group - D

6. (a) What is the received power for a given distance and frequency using Friis' equation? Explain clearly with the equation. [[CO2](Analyse/IOCQ)]
- (b) Explain the concepts of large scale and small scale fading with examples. List the factors influencing small scale fading. [[CO1, CO2](Remember/LOCQ)]
- (c) 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. [[CO2](Evaluate/HOCQ)]
- $$4 + 4 + 4 = 12$$
7. (a) Describe the different inter-frame spacing defined in IEEE 802.11 and also define the significance of those frames. [[CO4](Remember/LOCQ)]
- (b) If there is a hidden station problem and if two stations cannot hear each other during transmission, what will happen? How can this situation be eliminated? [[CO4](Remember/LOCQ)]
- (c) What is OFDMA technology (explain with diagram)? How is the guard band related with multipath delay spread? [[CO1, CO6](Apply/IOCQ)]
- (d) WiFi and WiMAX may be the alternative solution for fixed broadband services in rural areas. Comment on this issue. [[CO4, CO6](Apply/IOCQ)]
- $$3 + 3 + 3 + 3 = 12$$

Group - E

8. (a) Show with the help of a neat diagram the Mobile IP operation. Explain briefly the 4 steps. [[CO5](Analyse/IOCQ)]
- (b) What is the need for "Care of address" in a mobile IP network? What are the basic limitations of Mobile IPv4? [[CO5](Remember/LOCQ)]
- (c) What is agent discovery? Describe the three steps required for this. [[CO5, CO6](Analyse/IOCQ)]
- $$4 + 4 + 4 = 12$$

9. (a) Why does TCP not perform well in Adhoc wireless networks?
 [(C04,C05)(Remember/LOCQ)]
- (b) List the issues in designing a transport layer protocol for ad hoc wireless networks.
 [(C04,C05)(Remember/LOCQ)]
- (c) Why mobility of a node gives the biggest challenge in designing ad hoc network?
 [(C04, C05, C06)(Apply/IOCQ)]
- (d) Explain the Ad Hoc TCP with thin layer implementation and state transition diagram.
 [(C04, C05)(Apply/IOCQ)]
- 3 + 3 + 3 + 3 = 12**
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Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	34	50	16