

**BASICS OF MOBILE COMPUTING  
(CSEN 4282)**

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) Which of the following is not a connected state of a Bluetooth device?  
(a) Parked                      (b) Sniff                      (c) Standby                      (d) Hold.
- (ii) How many slaves can be connected to the master using SCO links in Bluetooth?  
(a) 3                                      (b) 4                                      (c) 5                                      (d) 7.
- (iii) In Mobile Assisted Handoff (MAHO), the handoff takes place when  
(a) the power received by the mobile station from other base station is more than the serving base station  
(b) the channel allocated is not available  
(c) the mobile station has no signal  
(d) all of the above.
- (iv) In a cellular system, the co-channel constraint is 2 and adjacent channel constraint is 1. Each cell is assigned two channels. There are four cells in this cellular system, arranged in such a manner that each cell is adjacent to two cells and not to the third cell.  
[So if you arrange the cells alphabetically, and call these A, B, C, D, then A is adjacent to B, D; B is adjacent to C, A; etc.]  
What is not a correct channel assignment of these four cells [assuming the above alphabetical order of nodes is maintained while assigning the channels]?  
(a) [(1,3), (4,6), (7,9), (10,11)]                      (b) [(1,3), (4,6), (1,3), (4,6)]  
(c) [(1,4), (2,5), (4,6), (2,4)]                      (d) [(1,4), (2,5), (4,6), (2,6)]
- (v) Among the following which one is used when two WLAN stations are in a dialog exchange?  
(a) SIFS                                      (b) DIFS                                      (c) EIFS                                      (d) PIFS.

- (vi) A \_\_\_\_\_ is self-created when roaming wireless devices are connected over a wireless link.  
(a) MANET                                      (b) WPAN  
(c) DARPA                                      (d) NTDR
- (vii) The process in which a Home Agent intercepts packets destined to one of its members and forwards it over the network to the Foreign Agent, is known as  
(a) tunnelling                                      (b) encapsulation  
(c) discovery                                      (d) none of the above.
- (viii) Hexagon shape is used for radio coverage for a cell because  
(a) it uses the maximum area for coverage  
(b) fewer number of cells are required  
(c) it approximates circular radiation pattern  
(d) all of the above.
- (ix) The advantage of using frequency reuse is  
(a) increased capacity  
(b) limited spectrum is required  
(c) same spectrum may be allocated to other network  
(d) all of the above.
- (x) Spread spectrum modulation involves  
1. PN sequence for modulation  
2. Large bandwidth  
3. Multiple users  
(a) (1) and (2) are correct  
(b) (1) and (3) are correct  
(c) (2) and (3) are correct  
(d) all the three are correct.

**Group - B**

2. (a) Explain with suitable diagram the common cellular system and explain the BSS components.  
(b) Explain the role of the HLR, VLR and MSC in roaming. **(3 + 3) + 6 = 12**
3. (a) Describe one distinguishing feature in each case of 1G, 2G, 3G and 4G networks.  
(b) Discuss the main characteristics of a Massive MIMO system in 5G.

- (c) Answer the following questions on 5G in each case by a single sentence:
- Why is a 5G cell architecture called heterogeneous?
  - What is Spatial Multiplexing?
  - How can Massive MIMO reduce interface latency?
  - How can radiated energy efficiency be improved in Massive MIMO?
  - How is Spectrum sharing achieved in 5G?

$$4 + 3 + (5 \times 1) = 12$$

### Group - C

4. (a) Explain the Hidden Terminal and Exposed Terminal problems in a WLAN system.
- (b) How does the CSMA/CA protocol work? In particular show the working of this protocol with respect to various Inter Frame Spacing times.

- (c) How does RTS/CTS based mechanism handle hidden station problem?

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

5. (a) Draw the Bluetooth protocol stack and explain the function of each layer in communication.
- (b) Draw and explain the states involved in Bluetooth connection establishment.

$$6 + 6 = 12$$

### Group - D

6. (a) What are the three main steps needed to handle mobile IP based networking?
- (b) Explain with a suitable diagram how an IP packet from a fixed machine X traverses the Internet to reach a mobile device A. In particular mention the roles played by the Home Agent and the Foreign Agent entities.
- (c) Explain with a diagram what happens to source and destination address fields of an IP packet undergoing encapsulation and decapsulation stages.

$$3 + 6 + 3 = 12$$

7. (a) What is the count-to-infinity problem?
- (b) What is the difference between DSDV and AODV?
- (c) Draw any graph consisting of 5 nodes and 7 or more edges. Number the nodes from 1 through 5. You may choose the weights of the edges according to your will. Consider the source node numbered 1 and any other node as a destination. Show with two different diagrams the working of the DSDV and AODV protocols on this graph respectively.

$$3 + 3 + (3 + 3) = 12$$

### Group - E

8. (a) Show the high level diagram of various software components organized as a stack inside an Android OS.
- (b) Name any five Android library components and in one sentence each explain their roles.
- (c) Name and explain the three concepts related to Android Event Handling mechanism.

$$3 + 5 + 4 = 12$$

9. (a) Mention the key services provided by the Android Application Framework.
- (b) How is the concept "resource" used in Android application development? Explain with the concept of a resource definition in XML and a code snippet in Java, how you can display the string "Hello World" on an Android screen.
- (c) What role does the AVD concept play in Android app development? What are the two states of an Android Service?

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