ADVANCED COMMUNICATION SYSTEMS
(ECEN 4103)

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)   Larger cells are more useful in_____
              (a) densely populated urban areas
              (b) mountainous areas
              (c) rural areas
              (d) lightly populated urban areas.

   (ii)   Which of the following is not an objective for channel assignment strategies?
              (a) Efficient utilization of spectrum   (b) Increase of capacity
              (c) Minimize the interference   (d) Maximize the interference

   (iii)   The concept of MAHO is applicable in
              (a) IG analog cellular system   (b) base station antennas
              (c) 2G cellular system   (d) none of these.

   (iv)   Free Space Propagation Model is mathematically represented by
              (a) Two ray propagation model   (b) Friis formula
              (c) path shadowing model   (d) Hata model.

   (v)   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.

(vi) In wideband systems, the transmission bandwidth of a single channel _____ coherence bandwidth of the channel.
(a) Equal to   (b) Not related to
(c) Larger than   (d) Smaller than.

(vii) How many users or voice channels are supported for each 200 KHz channel in GSM?
(a) Eight   (b) Three   (c) Sixty four   (d) Twelve.

(viii) What is the minimum spectrum allocation required by W-CDMA?
(a) 5 MHz   (b) 20MHz
(c) 1.25 MHz   (d) 200 KHz.

(ix) Which of the following specifies a set of media access control (MAC) and physical layer specifications for implementing WLANs?
(a) IEEE 802.16   (b) IEEE 802.3
(c) IEEE 802.11   (d) IEEE 802.15.

(x) 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.

Group – B

2. (a) Explain why square and circular cell structure is not suitable for ideal cell geometry.

(b) What is the different channel allocation schemes used in cellular communications? In which situations each of these schemes are suitable?

(c) How is signal to interference ratio (S/I) related with frequency reuse ratio q?

4 + (2+2) +4 = 12

3. (a) What is Doppler Effect? How does it affect the data communication of a moving MS?

(b) Categorize different types of fading occurred in communication.

(c) If the received power at a reference distance $d0 = 1$ 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 ht = 40 m, receiving antenna hr = 3m, Gt = Gr = 0 dB, operating frequency f = 1800MHz.

5 + 3 + 4 = 12

Group – C

4. (a)   Describe the major functionalities of MSC. Why is GMSC needed in GSM architecture?

  (b)   How are authentication and security maintained in GSM networks?

  (c)   Explain attach detach procedures of GPRS network.

(3+2) + 4 + 3 = 12

5. (a)   GPRS is the extension of GSM network. Explain with diagram.

  (b)   Discuss about the forward and reverse links in CDMA IS-95 systems.

  (c)   Explain (with suitable diagram) soft handoff in CDMA systems?

4 + 4 + 4 = 12

Group – D

6. (a)   What are the functions of DCF and PCF? Explain the importance of back-off algorithm.

  (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?

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

7. (a)   Why is CSMA/CD not suitable for wireless networks?

  (b)   What is OFDMA technology (explain with diagram)? How is the guard band related with multipath delay spread?

  (c)   WiFi and WiMAX may be the alternative solution for fixed broadband services in rural areas. Comment on this issue.

3 + (4 + 2) + 3 = 12

Group – E

8. (a)   What are the main functional entities for Mobile IP?

  (b)   How is data transferred to a mobile node in MIP operation?

  (c)   What is triangular routing in mobile IPv4?

4 + 4 + 4 = 12

9. (a)   Describe the free space propagation path loss model. When is two-ray propagation model suitable? What factors does the loss depend for two-ray model?

  (b)   How is frequency reuse concept useful in cellular communication? Explain briefly.

(4+1+2) + 5 = 12

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