(b) Explain the Tunneling operation with the help of a suitable block diagram.

6 + 6 = 12

9.(a) What are the different types of Ad Hoc mobile networks? Compare reactive and pro-active routings. How are route establishment and route discovery performed in DSDV protocol?

(b) How can the QoS of Ad Hoc wireless networks be improved?

(2 + 3 + 4) + 3 = 12

MOBILE COMMUNICATION
(ECEN 5203)

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) In CDMA cellular systems, the same pair of codes are allowed in
(a) another cell of same cluster
(b) same cell of another cluster
(c) multiple cells of same cluster
(d) only one cell in a cluster.

(ii) For GSM networks, the minimum C/I ratio required is
(a) 18 dB   (b) 12 dB
(c) 24 dB   (d) 10 dB.

(iii) Rake receivers are designed to nullify
(a) Frequency shift   (b) amplitude variation
(c) time delay   (d) code corruption.

(iv) For GSM cellular network, the up-link frequency is given as 895.5 MHz. The corresponding down-link frequency will be
(a) 940.5 MHz   (b) 940 MHz
(c) 850.5 MHz   (d) 920.5 MHz.

(v) Bluetooth can support upto .... nodes
(a) 49   (b) 69   (c) 29   (d) 79.

(vi) In cellular systems, the best method to reduce interference is to
(a) increase cluster size
(b) reduce transmit power level
(c) use sectorized antenna
(d) reduce cell dimension.

(vii) 20 dBm power is equivalent to
       (a) 100 mW   (b) 10 mW
       (c) 1 mW   (d) 100 W.

(viii) Scalability is a desired property of
       (a) Ad Hoc networks   (b) WLAN
       (c) Cellular networks   (d) all of these.

(ix)   Dynamic source routing protocol is
       (a) pro-active   (b) reactive
       (c) hybrid   (d) none of these.

(x)   Shadowing model is applied to predict RF propagation
       (a) in rural areas   (b) in urban areas
       (c) in dense urban areas   (d) none of these.

Group - B

2. (a) 1G to 3G – show with the help of a suitable diagram, the enhancement of capability with years. Compare 1G, 2G and 3G. Explain the frequency reuse concept in cellular systems. How has it helped the proliferation of cellular networks?

   (b) Differentiate between co-channel and adjacent channel interference in cellular systems. Describe different solutions to the problems. Why is the solution, just increasing the number of cells in a cluster, is not a good one? Justify.

                                                   (4 + 3) + 5 = 12

3. (a) Why is hand-off in GSM called break-before-make? Find out the maximum number of subscribers in a GSM system if reuse is not applied.

   (b) A total of 40 MHz BW is allocated to an FDD cell system which uses two 30 KHz simplex to provide full duplex voice and control channels. Calculate the number of channels/cell if the system uses 7-cell reuse.

                                                   (2 + 4) +6 = 12

Group - C

4. (a) The frame number requires total of 28 bits for its representation in GSM system whereas reduced frame number algorithm has brought it down to 19 bits. Explain this reduction and the benefit of this.

   (b) A total of 30 MHz bandwidth is allocated to a FDD cell system. It uses 2 numbers of 25 KHz simplex channels to provide full duplex communication. Calculate the number of channels per cell if the system uses (i) 7 cell reuse (ii) 19 cell reuse.

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

5. (a) Prove that for a DSSS system, $(E_b / N_o)_o = G_p . (E_b / N_o)_i$, where the symbols have their usual meanings.

   (b) A GSM system has 3 start bits, 3 stop bits, 26 TS bits, 8.25 guard bits and 2 bursts of 58 bits of data bits. The transmission speed is 270.833 Kbps. Find the frame efficiency.

                                                   8 + 4 = 12

Group - D

6. (a) State and explain Friis' equation for RF propagation. Why does this model fail in urban areas? How does Shadowing model work? Why have so many RF propagation models like Okumura, Hata etc. been devised?

   (b) Assume a receiver is located at 1 Km from a 5 W transmitter. The carrier frequency is 1800 MHz and free space propagation is applied. Determine (i) the power at the receiver (ii) the magnitude of the E-field at receiver antenna (iii) the rms voltage applied to the receiver input. (Consider the receiver antenna to be purely resistive with an impedance of 50 ohms and to be matched to the receiver circuit, $G_t = 1$ and $G_r = 2$).

                                                   (3 + 1 + 1 + 2) + (2 + 2 + 1) = 12

7. (a) What are the topologies used in WLAN? Explain AP-based topology with suitable diagram. What are the different physical layers defined in 802.11b? Explain their differences.

   (b) Indicate the differences between Piconet and Scatternet in Bluetooth network. What are the error correction schemes applied in Bluetooth?

                                                   (2 + 3 + 1 + 2) + (3 + 1) = 12

Group - E

8. (a) Describe the mobile IP operation clearly with the help of a schematic diagram.