



Name :

Roll No. :

Invigilator's Signature :

CS / M.TECH(ECE-MVLSI) / SEM-2 / MVLSI-205C / 2012

2012

MOBILE COMMUNICATION

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Attempt any *five* questions.

5 × 14 = 70

1. Show that the frequency reuse factor for a cellular system is given by k/s , where k is the average number of channels per cells and s is the total number of channels available to the cellular service provider.

How you can improve the capacity of a cellular system ?

5 + 9

2. Show that if $n = 4$, a cell can split into four smaller cells, each with half the radius and $1/16$ of the transmitter power of the original cell. If extensive measurements show that the path loss exponent is three, how should the transmitter power be changed in order to split a cell into four smaller cells ? What impact will this have on cellular geometry ? Explain your answer and provide drawings that show how the new cells would fit within the original macrocells. For simplicity use omnidirectional antennas.



3. a) Explain the chronological development of mobile communication starting from 8G, 3G to 4G.
b) Differentiate between GPRS and HSCSD. Explain the benefits of GPRS.
c) Explain WCDMA and discuss its related hardware.
 $4 + 4 + 6$
4. a) Write down the uplink and downlink frequencies of GSM 900, GSM 1800, IS95 system.
b) Write short notes on the following :
(i) CDMA- 2000
(ii) IS 95 Forward Traffic Channel Modulation Parameters.
c) Explain the difference between infrared WLAN and Radio-WLAN.
 $2 + (4 + 4) + 4$
5. a) Explain the advantage of CDMA system over GSM system.
b) Generation of PN sequence with proper circuit diagram .
c) Discuss the capacity of CDMA.
d) Choose the correct alternatives for the following :
I) Frame duration of GSM structure having 8 timeslot is
(i) 46.15 ms
(ii) 4.615 ms
(iii) 576.92 μ s
(iv) 6.12 s .
II) Modulation technique used in WCDMA is
(i) QPSK
(ii) GMSK
(iii) BPSK
(iv) DQPSK.



III) IS95 system downlink frequency is

- (i) 869-894 MHz
- (ii) 824-849 MHz
- (iii) 890-915 MHz
- (iv) 935-960 MHz

IV) GPRS developed in

- (i) 2 G
- (ii) 2.5 G
- (iii) 3 G
- (iv) 4 G.

2 + 5 + 3 + (4 × 1)

6. For a RF bw of $w = 1.25$ MHz and baseband information bit rate, $R = 9600$ bps and a minimum acceptable E_b/N_0 is found to 12 dB, determine the maximum number of users that can be supported in a single cell CDMA system, using (a) omnidirectional base station antennas and no voice activity detection and (b) three-sectors at the base station and activity detection with voice activity factor $\alpha = 7/16$.
7. a) Explain the advantages and disadvantages of the two-ray ground reflection model in the analysis of path loss in mobile radio communication.



- b) A mobile is located 5 km away from a base station and uses a vertical $\lambda/4$ monopole antenna with a gain of 2.55 dB to receive cellular radio signals. The E-field at 1 km from the transmitter is measured to be 10^3 V/m. The carrier frequency used for this system is 900 MHz.
- (i) Find the length and the effective aperture of the receiving antenna.
 - (ii) Find the received power at the mobile using the two-ray ground reflection model assuming the height of the transmitting antenna is 50 m and the receiving antenna as 1.5 m above ground.

$$5 + (4 \frac{1}{2} + 4 \frac{1}{2})$$

8. a) Explain with block diagram the principle of operation of GMSK Transmitter and Receiver used in cellular mobile communication system.
- b) Justify that diversity techniques definitely help in combating the multipath channel. What are the types of diversity techniques used in case of cellular communication ?
- c) Discuss the working of a matched filter and justify its suitability for the equalizers.

$$5 + 4 + 5$$
