53 (EC-615) MBCM

2018

MOBILE COMMUNICATION

Paper : EC-615

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

Answer question 1 and any four from the rest.

1. (a) The underlying concept of cellular communication is Frequency Reuse. —T/F. 1

   (b) The group of cells uses same set of frequencies are known as _____ cells. 1

   (c) For a cluster size 19, If the cell radius is 10*km*, what is the distance between two co-channel cells ? 1

   (i) 75·5*km*

   (ii) 87·5*km*

   (iii) 100*km*

   (iv) 102·3*km*.

(d) Among the below points which one is not true about sectorization : 2

   (i) It reduces signal to interference ratio

   (ii) It reduces interference

   (iii) It uses directive antenna

   (iv) It engazes the processor of MSC more compared to unsectored cell.

(e) If cell radius is made half, what will be the factor that transmission power is needed to be reduced ? 2

   (i) 1/2

   (ii) 1

   iii) 1/4

   (iv) 4

(f) What is the first cellular standard ?

   1

   (i) AMPS

   (ii) USDC

   (iii) ETACS

   (iv) GSM

(g) A car is moving at a velocity of $100 km/hr$ from a base station. Base station sends signal to the car at $900 MHz$ carrier frequency. What is the amount of maximum doppler spread ?   2

    (i) $83 Hz$

    (ii) $9 Hz$

    (iii) $132 Hz$

    (iv) $264 Hz$

(h) Diversity receiver increases   2

    (i) Signal bandwidth

    (ii) Reduces noise

    (iii) Increases SNR

    (iv) All of the above.

(i) GSM is a communication technology which uses —   2

    (i) TDD/FDMA

    (ii) FDD/TDMA

    (ii) TDD/TDMA

    (iv) FDD/FDMA

(j) Out of the following digital modulation techniques which one is the best in the context of generation of interference — 1

    (i) PSK

    (ii) MSK

    (iii) OQPSK

    (iv) GMSK

(k) Full form of GPRS is _____. 1

(l) Full form of ISDN is _____. 1

(m) CDMA has better interference rejection compared to GSM. — *T/F.* 1

(n) Which one of the following is not a channel parameter ? 2

    (i) Average excess delay

    (ii) Coherence time

    (iii) Coherence bandwidth

    (iv) Relaxation time.

2. *(a)* Find out the expression of SIR in a 7 cell cluster when mobile station is located at the corner of the cell. Show that if the path loss exponent is 4, the SIR is $17 \cdot 3 dB$. 8

(b) Derive the power relation between transmitted power and the received power in case when the in-between medium is water. Compare this relation with the case of free space and flat and open area. 12

3. (a) Name and define different channel parameters. 8

(b) What is fading? How can they be classified depending on different channel parameter relations? 12

4. (a) Explain why a digital modulation technique is required in case of wireless signal transmission. 4

(b) State why GMSK is widely used in mobile communication. Explain with block diagram, the working principle of GMSK. What benefit is obtained applying Gaussian filter over ordinary MSK? 3+4+5+4

5. (a) What is diversity receiver? Discuss different types of diversity techniques used in mobile communication.

3+6

(b) Consider the two-tap adaptive equalizer as shown in the following figure :

$$y_k = \sin\left(\frac{2\pi k}{N}\right)$$

$$dk = 2\cos\left(\frac{2\pi k}{N}\right)$$

$$x_k = w_0 y_k + w_1 y_{k-1}$$

$$e_k = error$$
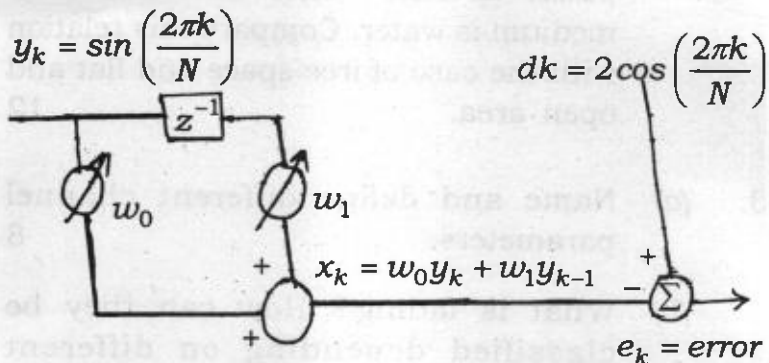
(a) Find an expression for MSE interms of w_0, w_1 and N.

(b) If $N > 2$, find the minimum MSE.

(c) If $w_0 = 0$, $w_1 = -2$ and $N = 4$ samples /cycle. What is the MSE ?

(d) For parameters in (c), what is the MSE if $dk = 2\sin\left(\frac{2\pi k}{N}\right)$.

3+3+2+3

6. (a) Draw a neat sketch of GSM architecture and show different interfaces. 5

(b) Describe functionalities of the following blocks of GSM architecture.   10

    (i) HLR   (ii) VLR

    (iii) AUC   (iv) GMSC

    (v) MSC

(c) Explain how spread spectrum reduces jamming and interference with necessary mathematical equation.

5

7. Write short notes on : *(any two)*

10×2

(i) Hand Off

(ii) LMS equalizer

(iii) Impulse response of a multipath channel

(iv) Generation technique of PN sequence.