Total No. of printed pages = 7

EC1318E033

Roll No. of candidate | | | | | | | | | | |

2020

B.Tech. 8th Semester End-Term Examination

ECE

WIRELESS COMMUNICATION

Full Marks – 50 Time – Two hours

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

Answer question No. 1 any five and any *three* from the rest.

(5 × 1 = 5)

1. Answer the following : (MCQ)

   (i) Which of the following systems is a 3G system?
   - (a) Analog Cellular System
   - (b) EDGE
   - (c) FM
   - (d) UMTS

   (ii) The type of access used in GSM technology is?
   - (a) FDMA/TDMA
   - (b) CDMA
   - (c) OFDMA
   - (d) All of the above

[Turn over

(iii) The cell having the same number In the adjacent cluster using the same set of RF channels are termed as

(a) Adjacent Cell

(b) Co-Channel Cell

(c) Macro Cell

(d) None of above

(iv) Higher value of Q is achievable in?

(a) big cluster size

(b) small cluster size

(c) medium cluster size

(d) None of the above

(v) Which of the following is a Invaild value for N (Cluster Size) for Cellular System?

(a) 7

(b) 3

(c) 4

(d) 9

(vi) Find the far-field distance for an antenna with maximum dimension of 1m operating at 900 MHz

(a) 6m

(b) 10m

(c) 30m

(d) None of all above

(vii) When a propagating EM wave with a wavelength smaller than the size of object it impinges on _____happens.

(a) Reflection

(b) Diffraction

(c) Scattering

(d) None of all above

(viii) ———————— propagation model helps in determine the actual footprint of a Cell in a Cellular System:

(a) Large Scale

(b) Small Scale

(c) Medium Scale

(d) None of all above

(ix) If the Transmission BW exceeds the Coherence BW ———————— is needed in the system.

(a) Polarizer

(b) Equalizer

(c) Synthesizer

(d) None of all above

(x) The standard name for Wi-Fi technology is

(a) IEEE 802.14

(b) IEEE 802.01

(c) IEEE 811.00

(d) IEEE 802.11

2. (a) Describe the frequency reuse concept in cellular technology with neat diagrams. (7)

(b) A cellular service provider decides to use a digital TDMA scheme which can tolerate a signal to interference of 15 dB in the worst case. Find the optimal value of N for:-

(i) Omni-directional antennas.

(ii) 120 degree sectoring

(iii) 60 degree sectoring should be used. lf so which cases 60 degree or 120 degree should be used? Assume a path loss component=4 and consider Trunking efficiency. (8)

3. (a) Consider a cellular system in which the total available voice channels allocated are 1200. The area of each cell is 9 km2 and the total coverage area of the system is 3600 km2.

(i) Calculate the system capacity if the cluster size, N is 4.

(ii) Calculate the system capacity if the cluster size, N is 7. Does decreasing the reuse factor N increase the system capacity?

(iii) How many times should the cluster size of 7 be replicated to cover the entire cellular area? (6)

(b) What is Handoff? Illustrate with neat diagram handoff procedure. (6)

(c) What is the difference between Soft and Hard handoff? (3)

4. (a) Differentiate between Large Scale and Small Scale Propagation model in Wireless Communication. (4)

(b) Draw a neat labelled diagram of 2-Ray Ground Propagation Model. Also list the relevant equations. (4)

(c) A mobile is located 5 km away from base stations and uses vertical $\chi/4$ 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^−3V/m. The carrier frequency used for this system is 900 MHz.

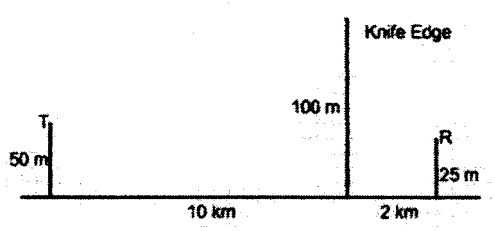
(i) Find the length and the effective aperture of the receiving antenna.

(ii) Find the received power at the mobile using the two ray ground reflection model assuming the height of the transmitting antenna 50m and the receiving antenna is 1.5m above ground (7)

5. (a) Given the following geometry, determine:

(i) The loss due to knife-edge diffraction

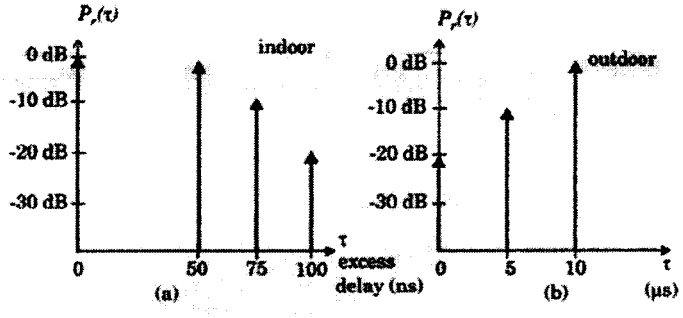
(ii) The height of the obstacle required to induce 6 dB diffraction loss. Assume f=900 MHz (8)



(b) Briefly Explain the Okumura Model with relevant plots and equations. (7)

6. (a) List and Briefly explain factors influencing Small Scale Fading (7)

(b) If a particular modulation provides suitable BER performance whenever $\frac{\sigma T}{T_S} \leq 0.1$ Determine the smallest symbol period T_S (and thus the greatest symbol rate) that may be sent through RF channels shown in Figure below without using an equalizer. (8)



7. (a) What is meant by the spread spectrum technique? Explain the working of direct sequence spread spectrum transmitter and receiver. (9)

(b) Name a few multiple access schemes. Explain any two in briefly. (6)

8. (a) Explain any two Diversity Techniques used in Wireless Communication. (6)

(b) Considering the design of US Digital Cellular equalizer. If f=900 MHz and the mobile velocity v=8okmph, determine the following:

(i) The maximum Doppler shift

(ii) The coherence time of the channel

(iii) The maximum number of symbols that could be transmitted without updating the equalizer assuming that the symbol rate is 24.3ksymbols/sec. (9)

9. Write a short note on any Three of the following topics: ($3 \times 5 = 15$)

(a) TDMA

(b) Time Dispersion Parameters

(c) RAKE Receiver

(d) CDMA

(e) 4G

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