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Azara, Hatkhowapara,
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Roll No. of candidate

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2019

B.Tech. 8th Semester End-Term Examination

WIRELESS COMMUNICATION

Elective - III — Departmental

Full Marks – 100

Time – Three hours

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

Answer Question No. 1 and any six from the rest.

1. Answer the following : (10 × 1 = 10)

(i) Multiple access technique used in Japanese
Digital Cellular (JDC) is

(a) FDMA/FDD

(b) TDMA/FDD

(c) FDMA/TDD

(d) TDMA/TDD

[Turn over

- (ii) Fast Frequency hopping system is characterized by
- (a) Rate of change of carrier frequency is greater than the symbol rate
 - (b) Rate of change of carrier frequency is less than the symbol rate
 - (c) Rate of change of carrier frequency is equal to the symbol rate
 - (d) None of the above
- (iii) "If the base band signal bandwidth is _____ B_D , the effects of Doppler spread are negligible at the receiver".
- (a) Less than
 - (b) Equal to
 - (c) Greater than
 - (d) None of the above
- (iv) A signal undergoes fast fading if
- (a) $T_S > T_C$ and $B_S < B_D$
 - (b) $T_S = T_C$ and $B_S < B_D$
 - (c) $T_S > T_C$ and $B_S = B_D$
 - (d) $T_S < T_C$ and $B_S > B_D$
- (v) Subjective test on U.S. AMPS cellular system indicated that sufficient voice quality is provided when S/I is greater than or equal to
- (a) 17 dB
 - (b) 18 dB
 - (c) 15 dB
 - (d) 16 dB
- (vi) The term RSSI refers to
- (a) Reversed Signal Strength Indicator
 - (b) Received Short Signal Indicator
 - (c) Reversed Short Signal Indicator
 - (d) Received Signal Strength Indicator

(vii) If the cluster size is $N = 13$ the shift parameters (i, j) are

- (a) (1, 1) (b) (1, 3)
(c) (3, 3) (d) (3, 2)

(viii) The macro and micro cells are available in

- (a) Handoff
(b) Cell Sectorization
(c) Co-Channel cellular region
(d) Umbrella Cell pattern

(ix) Cordless telephone systems are _____ communication system

- (a) Full Duplex
(b) Half Duplex
(c) Simplex
(d) Duplex

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(x) LTE stands for

- (a) Lite Technical Edge
(b) Long Term Evolution
(c) Linear Technological Evolution
(d) Linear Technical Edge

2. (a) Why is FM. rather than AM used in most mobile radio systems today? List as many reasons as you can think of and justify your responses.

(7)

(b) List the factors that led to the development of (i) The GSM system for Europe and (ii) the U.S. Digital cellular system.

(8)

3. (a) Explain the concept of cellular frequency reuse with proper diagram. (4)
- (b) Why hexagonal shape of the cell is chosen to represent the coverage area of a base station? (3)
- (c) Explain how sectoring decreases the co-channel interference? (3)
- (d) 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 sectoring be used? If so which case 60/120 degree should be used?

Assume a path loss component = 4 and consider trunking efficiency. (5)

4. (a) Describe the handoff strategies with proper and neat diagram. (8)
- (b) A certain city has an area of 1300 square miles and is covered by a cellular system using a 7 cell reuse pattern. Each cell has a radius of 4 miles and the city is allocated 40 MHz of spectrum and a full duplex channel bandwidth of 60 KHz. Assume a GOS of 2% for an Erlang B system is specified. If the offered traffic per user is 0.02 Erlangs. Compute (i) the number of cells in the service area. (ii) the number of channels per cell, (iii) traffic intensity of each cell, (iv) the maximum carried traffic. (v) the

total number of users that can be served for 2% GOS. (vi) the number of mobiles per channel and (vii) the theoretical maximum number of users that could be served at one time by the system. (7)

5. (a) Describe Knife-edge diffraction model. (7)
(b) Explain fading effects due to multipath time delay spread? (8)
6. (a) What is Spread Spectrum Multiple Access (SSMA)? Explain in brief types of SSMA techniques. (7)
(b) Compare FDMA and TDMA schemes. (8)
7. (a) Explain the need of equalization in communication receiver. (5)
(b) Discuss any two diversity technique used in wireless communication. (5)
(c) Why interleaving has become an extremely useful technique in all second generation digital cellular systems? (5)
8. (a) Define the following terms : (7)
(i) Set-up time
(ii) Blocked call
(iii) Coherence bandwidth
(iv) Grade of service
(v) Control channel
(vi) Full Duplex System
(vii) Traffic intensity.
- (b) Prove that for a hexagonal geometry, the co-channel reuse ratio is given by $Q = \sqrt{3N}$, where $N = i^2 + j^2 + ij$. (8)

9. Write a short note on any *three*.

(3 × 5 = 15)

- (a) WiMAX
- (b) 3G-LTE
- (c) IEEE 802.6
- (d) UGS
- (e) CT-2.

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