

CS/B.Tech/ECE/Odd/Sem-7th/EC-701/2015-16



**MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY,  
WEST BENGAL**

EC-701

**WIRELESS COMMUNICATION AND NETWORK**

Time Allotted: 3 Hours

Full Marks: 70

*The questions are of equal value.*

*The figures in the margin indicate full marks.*

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

*All symbols are of usual significance.*

**GROUP A**

**(Multiple Choice Type Questions)**

1. Answer any ten questions.

10×1 = 10

- (i) A service area is covered with 10 clusters having 7 cells in each cluster and 16 channels assigned in each cell. The numbers of channels per cluster are

(A) 16                      (B) 70                      ~~(C) 112~~                      (D) 1120

- (ii) In a mobile radio environment, the frequency re-use ratio,  $q$  and carrier-to-interference ratio  $C/I$  are related by the following expression

~~(A)  $q = \left(6 \times \frac{C}{I}\right)^{\frac{1}{4}}$~~       (B)  $q = \left(6 \times \frac{C}{I}\right)^{\frac{1}{2}}$       (C)  $q = \left(\frac{1}{6} \times \frac{C}{I}\right)^{\frac{1}{4}}$       (D)  $q = \left(\frac{1}{6} \times \frac{C}{I}\right)^{\frac{1}{2}}$

- (iii) The most critical feature of TDMA operation is,

~~(A) dividing the carrier channel bandwidth into time slots~~  
(B) assignment of time slots among multiple subscribers  
(C) time synchronization to the incoming TDMA frame  
(D) providing different access to subscribers

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- (iv) The gross data rate of each carrier channel in GSM is,

~~(A) 270.833 kbps~~      (B) 33.854 kbps      ~~(C) 24.7 kbps~~      (D) 13.4 kbps

- (v) The standard interface that connects a BTS to BSC is called,

(A)  $U_m$                       ~~(B) A-bis~~                      (C) A                      (D) D

- (vi) Each carrier of the IS-95 standard occupies a bandwidth of

(A) 25 KHz                      ~~(B) 200 KHz~~                      (C) 30 KHz                      ~~(D) 1250 KHz~~

- (vii) The CDMA reverse channel employs the digital modulation technique of

(A) BPSK                      ~~(B) O-QPSK~~                      (C) QPSK                      (D) OFDM

- (viii) The size of a file transferred in 8 seconds in the IEEE 802.11 WLAN system operating at 2 Mbps data transmission rate is,

(A) 2 MB                      (B) 4 MB                      ~~(C) 16 MB~~                      (D) 32 MB

- (ix) The Wi-Fi technology is specified in

~~(A) IEEE 802.11 WLAN standards~~      ~~(B) IEEE 802.11a WLAN standards~~  
(C) IEEE 802.11b WLAN standards      (D) IEEE 802.11g WLAN standards

- (x) GPRS is a,

(A) Circuit-switched-cum-packet-oriented service for mobile users.  
~~(B) Packet-oriented service for mobile users.~~  
(C) Asynchronous packet-oriented service for mobile users.  
(D) Synchronous packet-oriented service for mobile users.

- (xi) What is the type of modulation scheme used with AMPS?

(A) WCDMA                      (B) FDMA                      (C) TDMA                      (D) CDMA

- (xii) Determine the distance from the nearest co-channel cell for a cell having a radius of 0.64 km and a co-channel reuse factor of 12

(A) 8.62 km                      (B) 6.68 km                      (C) 7.68 km                      (D) 9.68 km

- (xiii) Interference on voice channel usually causes

(A) missed calls                      (B) blocked calls      (C) dropped calls      (D) cross talk

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**GROUP B**  
(Short Answer Type Questions)

Answer any *three* questions.

3×5 = 15

2. Define the term EIRP. What is the path loss in dB for free space propagation model? 2+3
3. What is adjacent channel and co-channel Interference? Explain how we can minimize them. 2+3
4. What is fading? What is the difference between Flat Fading and Frequency Selective Fading? 2+3
5. What are the operating frequencies for AMPS uplink and downlink channels? What are the functions of SCM, SAT and ESN in AMPS. 2+3
6. With a neat diagram explain the authentication procedure of GSM. 5

**GROUP C**  
(Long Answer Type Questions)

Answer any *three* questions.

3×15 = 45

7. (a) Define the terms "cell" and "cluster" for cellular networks. Explain the concept of "FREQUENCY REUSE" as applied to Cellular Communications. Derive an expression relating signal to noise ratio (S/I) in Co-channel Interference and frequency reuse ratio (Q). 2+3+4
- (b) A cellular provider decides to use TDMA schemes that can tolerate S/I ratio of 16dB. Find the optimum value of cluster size N in case of (i) Omi-directional antenna (ii) 120° sectoring and (iii) 60° sectoring, justify which sectoring is better, 60° or 120°? Assume path loss exponent n=4. 6
8. (a) What is Free space Propagation model and mention the condition for which it is valid. Determine the path difference and phase difference of two ray ground reflection model. What is Log-distance path loss model and mention the limitation of this model. 3+5+3

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- (b) If the received power at a reference distance  $d_0 = 1\text{Km}$  is equal to  $1\mu\text{Watt}$ , find the received power at distance of 2Km, 4Km and 8Km from the same transmitter using the exact expression of two ray ground reflection model. Given height of transmitting antenna is  $h_t = 40\text{m}$  height of receiving antenna  $h_r = 3\text{m}$ ,  $G_t = G_r = 0\text{ dB}$  and operating frequency  $f = 1800\text{MHz}$ . 4

9. With a neat diagram explain the authentication procedure of GSM. Explain the roles played by VLR, HLR, MSC and EIR during call setup. Write down the different interfaces which are used in GSM architecture. What are the two new nodes are used in GPRS for packet data service - explain each of them. 3+6+3+3

10. What is hidden terminal problem and exposed terminal problem? How these problems can be solved? With a flow chart describe how back-off timer of contention window is set in CSMA/CA for WLAN. How Mobile Station (MS) selects their Access Points (APs) in WLAN environment. Explain the WLAN system architecture. 2+3+6+2+2

11. What are the main three phases of MIPv4? Explain with neat diagram how Mobile Node registers its current location with Foreign Agent and Home Agent in MIPv4. What is Denial-of-Service Attack in MIPv4 and how it can be solved? What is tunneling in MIPv4? 2+6+4+3

12. Write short notes on any *three* of the following: 3×5

- (a) CDMA
- (b) GPRS architecture
- (c) 3G over 2G networks
- (d) UMTS
- (e) Wimax architecture.

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