



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

**Paper Code : EC-701**

**WIRELESS COMMUNICATION & NETWORK**

*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.*

**Group – A**

**(Multiple Choice Type Questions)**

1. Choose the correct alternative for *any ten* of the following:

1×10=10

(i) Soft hand-off is used by

(a) GSM

(b) ARMS

(c) USDC

(d) CDMA

(ii) The concept of “frequency reuse” technique is used in

(a) cellular system

(b) conventional mobile telephony

(c) paging system

(d) cordless telephony

(iii) If the bandwidth of the transmitted signal is larger than the channel coherence bandwidth, then the signal could be severely influenced by

(a) Frequency selective fading.

(b) Flat fading.

(c) Fast fading.

(d) Slow fading.

(iv) Bluetooth is a

(a) a wireless LAN.

(b) WAN.

(c) short range infrared ad-hoc.

(d) short range wireless ad-hoc LAN service.

(v) Interference on voice channel usually causes

(a) missed calls

(b) blocked calls

(c) dropped calls

(d) cross talk

- (vi) Mobile IP refers to
- (a) mobility
  - (b) IP tuning
  - (c) IP within IP
  - (d) All of these
- (vii) Free space propagation path loss is
- (a) inversely proportional to frequency of transmission.
  - (b) directly proportional to frequency of transmission.
  - (c) independent of frequency of transmission.
  - (d) directly proportional to square of the frequency of transmission.
- (viii) Cells using the same set of frequencies are called
- (a) Neighbouring cells
  - (b) Adjacent channel cells
  - (c) Co-channel cells
  - (d) Clusters
- (ix) For a given frequency re-use ration of 3, the cluster size is
- (a) 3
  - (b) 4
  - (c) 7
  - (d) 12
- (x) The basic frequency region on GSM is
- (a) 900 MHz
  - (b) 1800 MHz
  - (c) 1900 MHz
  - (d) All of these
- (xi) Cordless phones can operate at
- (a) 4.2 GHz
  - (b) 3.8 GHz
  - (c) 5.8 GHz
  - (d) 6.2 GHz
- (xii) Data rate for 3G fast moving vehicle wireless network is
- (a) 144 Kbps
  - (b) 384 Kbps
  - (c) 2 Mbps
  - (d) 1 Mbps
- (xiii) In digital cellular telephony GSM uses 1800 MHz frequency band which uses uplink and downlink frequency. The difference of frequency 75 MHz is divided into
- (a) 150 carrier channel
  - (b) 374 carrier channel
  - (c) 210 carrier channel
  - (d) 390 carrier channel

**Group – B**

**(Short Answer Type Questions)**

5×3=15

**Answer any three of the following.**

2. Prove that for a hexagonal cell geometry, the co-channel reuse ratio is given by  $Q = \sqrt{3N}$  where  $N = i^2 + ij + j^2$ .
3. Compare GSM and CDMA.
4. Draw and explain the block diagram of GPRS Network Architecture.
5. Explain with diagrams the different hand-off processes used in CDMA-based cellular network.
6. How does a wireless LAN with IEEE 802.11 standard try to solve collisions or minimize the probability of collisions?

**Group – C**

**(Long Answer Type Questions)**

15×3=45

**Answer any three of the following.**

7. (a) What is Multiple access?  
(b) Define spectral efficiency. What are the factors which determine the spectral efficiency of a wireless system?  
(c) Calculate the spectral efficiency in FDMA systems.  
(d) The total bandwidth in an AMPS cellular system is allocated as 12.5 MHz. Using FDMA, 416 number of available channels with a spacing of 30 kHz are allocated to the users.  
(i) What is the guard bandwidth used in the system?  
(ii) What is the spectral efficiency for this system if there are 21 channels used for control signalling?  

2+(2+2)+5+(2+2)=15
8. (a) Draw the basic block diagram of 3G UMTS mobile architecture. Explain its operation.  
(b) What are the functions of RNC and Node B in UMTS?  
(c) What are the frequency bands allocated for UMTS?  
(d) What are the attach detach procedures in GPRS?  

(3+3)+(2+2)+2+3=15

9. (a) Discuss two-ray propagation model and explain how it differs from free space propagation path model.  
(b) Show how velocity of a mobile set may cause fading in cellular communication.  
(c) Find the Fraunhofer distance for an antenna with maximum dimensions of 1 meter and operating frequency of 900 MHz. If antennas have unity gain, calculate the path loss in dB. Assume system loss factor,  $L = 1$ . 6+5+4=15
10. (a) What is mobile IP and why is it needed?  
(b) Explain the main three phases of MIPv4.  
(c) Explain with neat diagram how mobile node registers its current location with Foreign Agent and Home Agent in MIPv4.  
(d) What is Tunneling in MIPv4? (3+2)+3+5+2=15
11. Write short notes on *any three* of the following:  
(a) Code Division Multiple Access  
(b) GSM logical channels  
(c) Capacity enhancement techniques for cellular networks  
(d) CSMA/CD vs. CSMA/CA  
(e) WiMAX

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