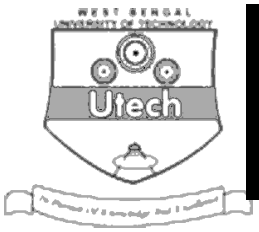
# CS/M.Tech(CSE)/SEM-2/CSTE-22/09
# MOBILE NETWORKING & COMPUTING - II ( SEMESTER - 2 )




1. .....
*Signature of Invigilator*

2. .....
*Signature of the Officer-in-Charge*

***Reg. No.***

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | |

***Roll No. of the Candidate***

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | |

– – – – – – – – – – – – – – – – – – – – – – – – – – – – – – – – – – – – – – – – – – – – – – – – – – – –

**CS/M.Tech(CSE)/SEM-2/CSTE-22/09**

**ENGINEERING & MANAGEMENT EXAMINATIONS, JULY – 2009**

## MOBILE NETWORKING & COMPUTING - II ( SEMESTER - 2 )

Time : 3 Hours ] [ Full Marks : 70

***INSTRUCTIONS TO THE CANDIDATES :***

1. This Booklet is a Question-cum-Answer Booklet. The Booklet consists of **32 pages**. The questions of this concerned subject commence from Page No. 3.
2. You have to answer the questions in the space provided marked 'Answer Sheet'. Write on both sides of the paper.
3. **Fill in your Roll No. in the box** provided as in your Admit Card before answering the questions.
4. Read the instructions given inside carefully before answering.
5. You should not forget to write the corresponding question numbers while answering.
6. Do not write your name or put any special mark in the booklet that may disclose your identity, which will render you liable to disqualification. Any candidate found copying will be subject to Disciplinary Action under the relevant rules.
7. **Use of Mobile Phone and Programmable Calculator is totally prohibited in the examination hall.**
8. You should return the booklet to the invigilator at the end of the examination and should not take any page of this booklet with you outside the examination hall, **which will lead to disqualification**.
9. Rough work, if necessary is to be done in this booklet only and cross it through.

**No additional sheets are to be used and no loose paper will be provided**

**FOR OFFICE USE / EVALUATION ONLY**

Marks Obtained

| ***Question Number*** | | | | | | | | | | | ***Total Marks*** | ***Examiner's Signature*** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Marks Obtained*** | | | | | | | | | | | | |

.....
**Head-Examiner/Co-Ordinator/Scrutineer**

DO NOT WRITE ON THIS PAGE

# CS/M.Tech(CSE)/SEM-2/CSTE-22/09

# MOBILE NETWORKING & COMPUTING - II

## SEMESTER - 2

Time : 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.*

Answer question No. 1 and any *four* from the rest.

1. a) Consider a cell phone network. Assume that the geographical area covered by the network has been divided into a 2-dimensional array of square cells. When there is an incoming call for a given mobile, the network has to find the cell in which the mobile is currently located. This is done by having each mobile inform a central control of its current location, every once in a while. The network queries for the mobile in a group of cells near the mobile's last known location.

   One strategy is for the mobile to inform the central control after every $k$ cell changes, for a given integer $k$. What is the number of cells the system must query if $k = 3$ ? 5

   b) Why is the spread spectrum transmission scheme used in wireless LAN under IEEE 802.11 ? What are the two radio transmission schemes used therein ? 5

2. a) A mobile device can at best find six mobile devices reaching in its vicinity. Let there be FDMA mode access by a node. Assuming that $f_{w0}$ is the bandwidth requirement between two neighbors, what bandwidth will be needed when all next hop neighbors communicate in full duplex mode and in same time slots ?

   If each node path and each direction hop is scheduled to operate at different instants, as in TDMA, then what will be the required bandwidth ? 5

   b) Describe the main differences and similarities between the original IEEE 802.11 and IEEE 802.11b standards in terms of physical layer characteristics. 5

   c) Describe how a station gets connected to an IEEE 802.11 wireless LAN when it is first powered up and how the power-saving mode works in an IEEE 802.11 device. 5

3. a) A QPSK/DSSS WLAN is designed to transmit in the 902-928 MHz ISM band. The symbol transmission rate is 0.5 Mega symbols/sec. An orthogonal code with 16 symbols is used. A bit error rate of $10^{-5}$ is required. How many users can be supported by the WLAN ? A sector antenna with a gain of 2.6 is used. Assume interference factor $\beta = 0.5$ to account for the interference from users in other cells and power control efficiency $\alpha = 0.9$. What is the bandwidth efficiency ? 8

b) What do you mean by hidden terminal problem in adhoc network ? Suggest a method to improve it. 7

4. a) Consider 802.11 BSS with three stations ( $STA_1$ to $STA_3$ ) all within range of each other and operating in DCF mode. Data frames of various sizes arrive for transmission at the respective MAC layers as follows :

***Table***

Compute the earliest time by which all the frames can be delivered to the destinations. Assume : Slot_time = 20 $\mu$s, SIFS_time = 10 $\mu$s, Fragmentation_threshold = 2400 bytes, RTS_threshold = 1200 bytes, RTS_size = CTS_size = ACK_size = 100 bytes, 200 bytes may be transmitted in one Slot Time. 8

b) What are the factors affecting TCP performance in MANET ? Explain why TCP performance typically degrades when caches are used for route repair. 7

5. a) When $n$ identical randomly located nodes, each capable of transmitting at $W$ bits/sec and using a fixed range, form a wireless network, the throughput $\lambda(n)$ obtainable by each node for a randomly chosen destination is $\Theta\left(\frac{W}{\sqrt{n \log n}}\right)$ bits/sec under a non-interference protocol. Verify the result above analyzing in terms of transport capacity of wireless networks. 8

b) Describe the main differences between the IEEE 802.11a and IEEE 802.11b wireless LANs and explain why the devices of the two standards cannot work together. 7

6. a) The traffic in an IEEE 802.11b wireless LAN consists of constant length UDP packets ( assuming "long" frame fromat, where the PHY header bit rate is 1 Mbit/s ).

Each packet contains a UDP payload of 1500 bytes. The wireless LAN uses one channel only ( eg. channel 10 ). the maximum bit rate ( 11 Mbit/s ) can be maintained between all wireless stations and the access point. Estimate the maximum throughput of the wireless LAN in Mbit/s. 8

b) How does an adhoc network differ from a cellular network, like GSM ? Mention the advantages of adhoc network over GSM network. 7

7. a) Estimate the number of mobile users that can be supported by a CDMA system using an RF bandwidth of 1.25 MHz to transmit data at 9.6 kbps. Assume $E_b / N_0$ = 6 dB, frequency reuse efficiency is 0.45, bandwidth efficiency factor is 0.9 and efficiency of sector-antenna in cell is 1. Suppose the voice activity factor for the talk spurts is 60% and the power control accuracy is 80%, what is the number of mobile users that can now be supported ? 8

b) "Flooding is a robust protocol to make path discovery in a adhoc network." Do you agree with this statement ? Justify your answer. 7

END