

BRAC UNIVERSITY
Department of Computer Science and Engineering

Examination: Semester Final
Duration: 1 Hour 45 min

Semester: Summer 2022
Full Marks: 40

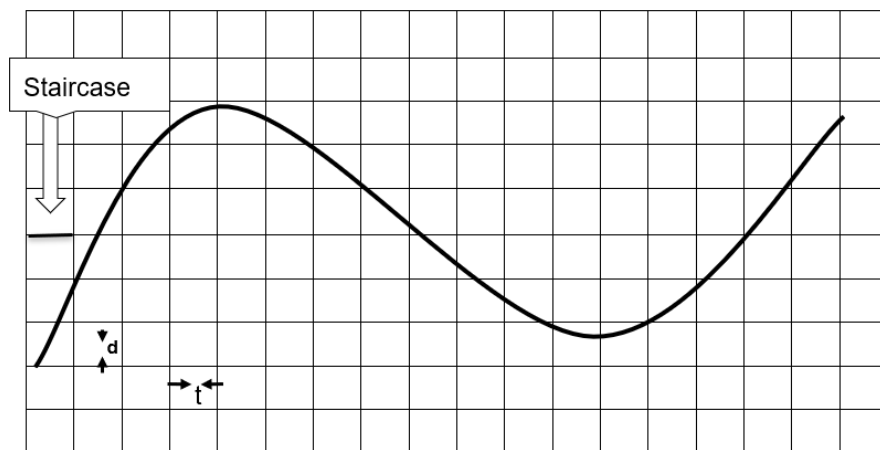
CSE 320: Data Communications

Answer the following questions.
Figures in the right margin indicate marks.

SET B

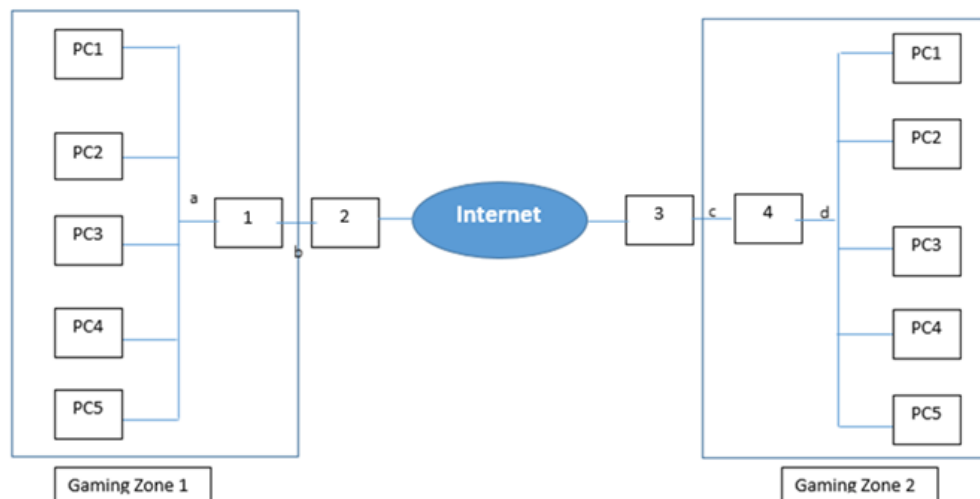
Name:	ID:	Section:
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1. CO2 a) **Show** the staircase in the following graph and generate the digital data from the given analog signal using the Delta Modulation (DM) technique. 6
- Answer this question in the question paper itself. You don't have to answer this question in the answer script.



0

- CO4 b) Suppose you want to hold an online gaming tournament final between two teams. Each team contains 5 players and each player will use a single PC. But the issue is that the two teams will participate from 2 different gaming zones which belong to 2 different networks. All the members of the same team belong to the same network. So, the situation is given below: 4

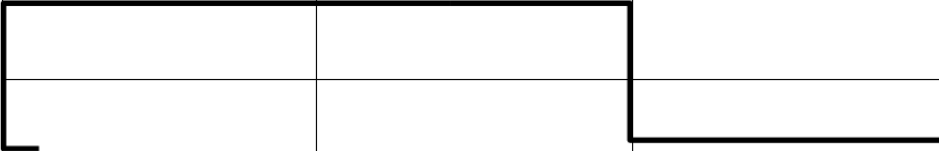


Now that you are given the design of the whole network, do the following to complete the network design: -

- I. **Identify** the interconnecting device to be used in boxes marked 1, 2, 3, 4.
- II. **Identify** the types of cables (Straight-through/copper crossover) to be used in places marked a, b, c, d.

2. CO3 a) **Consider** there are five channels, two with a bit rate of 240 kbps and three with a bit rate of 180 kbps, are to be multiplexed using multiple-slot TDM with one synchronization bit. Write the following answers: 6
- I. What is the size of a frame in bits?
 - II. What is the frame rate?
 - III. What is the duration of a frame?
 - IV. What is the data rate?
 - V. What is the output bit duration?
 - VI. How many input channels are there after doing multiple-slot TDM?
- b) Why is the guard band necessary to use in FDM and not in TDM? Assume twelve 5.2 kHz channels are multiplexed in a 69 kHz channel using FDM. **Calculate** the bandwidth of the guard bands. **Illustrate** with visual representation. 4

3. CO3 a) How does DSSS achieve bandwidth spreading and provides privacy? **Sketch** the Spread Signal from the following Original Signal and the given spreading code. 6

1	1	0
		
1 0 1 1 0 1 1 1 0 0 0	1 0 1 1 0 1 1 1 0 0 0	1 0 1 1 0 1 1 1 0 0 0

- CO5 b) In Slotted Aloha when the number of nodes increases, the efficiency decreases, **Explain** how? 4

4. CO5 a) Suppose you want to transmit the message 11011011 and protect it from errors using the CRC generator polynomial $x^3 + 1$. Using binary division, **show** the message that should be transmitted. 6

Later, corrupt the left-most third bit of the transmitted message and show that the error is detected by the receiver using CRC technique.

- b) **Classify** the medium access protocols which are collision-free. Why the efficiency of pure ALOHA is half of slotted ALOHA technique? 4

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Semester: Fall 2022
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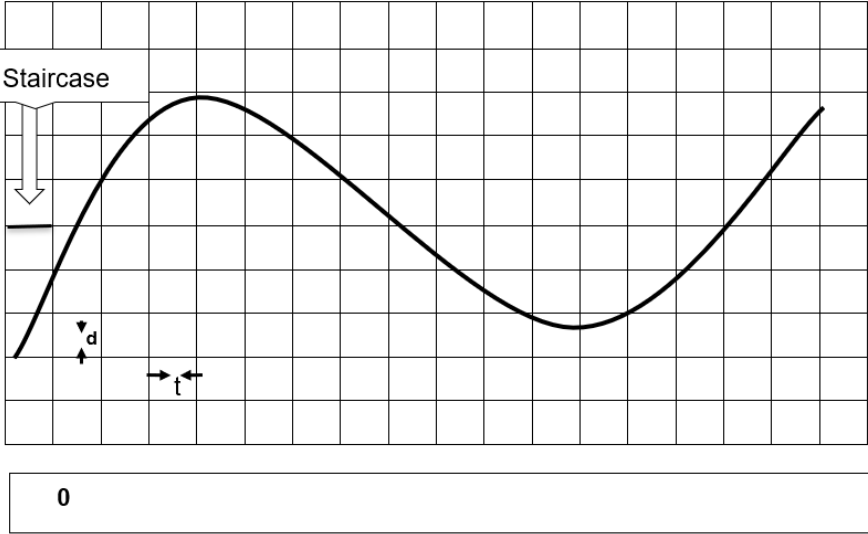
CSE 320: Data Communications

Answer the following questions.
Figures in the right margin indicate marks.

SET A

Name:	ID:	Section:
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1. [CO3]	a)	<p>Explain how FHSS achieves bandwidth spreading and privacy in brief.</p> <p>Suppose, you are given with the k-bit pattern and Carrier Frequency as follows:</p> <p>k-bit pattern</p> <table border="1"><tr><td>10 11 01 00</td></tr></table> <table border="1"><thead><tr><th>k-bit</th><th>Carrier Frequency</th></tr></thead><tbody><tr><td>00</td><td>250kHz</td></tr><tr><td>01</td><td>150 kHz</td></tr><tr><td>10</td><td>350 kHz</td></tr><tr><td>11</td><td>450 kHz</td></tr></tbody></table> <p>Draw FHSS cycle 3 times using the above pseudo random generated k-bit pattern and given frequency table. (** Hint: Draw the Carrier frequency graph against hop period)</p>	10 11 01 00	k-bit	Carrier Frequency	00	250kHz	01	150 kHz	10	350 kHz	11	450 kHz	2+4
10 11 01 00														
k-bit	Carrier Frequency													
00	250kHz													
01	150 kHz													
10	350 kHz													
11	450 kHz													
[C05]	b)	<p>Write four functions of the data link layer. Discuss the importance of calculating minimum hamming distance during the making of codewords in Blocking coding technique?</p>	4											

2. [CO3]	<p>a) Consider, some students of Brac University have opened a new telecommunication company named “BracT”. They want to use the concept of multiplexing to multiplex 10 channels. The channels send 240 pages in one second where each page consists of 300 characters. If two characters at a time are to be multiplexed using TDM with 1 synchronization bit. Answer the following questions:</p> <ol style="list-style-type: none"> What is the input data rate for each of the connections? What is the input bit duration? What is the frame rate? What is the duration of a frame? What is the output data rate? What is the output bit duration? <p>b) Suppose you have five channels among which 4 channels have a bandwidth of 1400 kbps and one with 1250 kbps. How would you multiplex this? Draw and validate with visual representation.</p>	6
3. [CO2]	<p>a) Show the staircase in the following graph and generate the digital data from the given analog signal using the Delta Modulation (DM) technique. You have to answer this question in the question paper only.</p> 	6
[CO4]	<p>b) From the following scenarios, find the best suited transmission mediums and give proper reasoning for your selection.</p> <ol style="list-style-type: none"> In Bangladesh, BTCL is the central organization that provides telephone line connections to every organization, offices and houses. Bangladesh Betar is the state-owned radio broadcaster of Bangladesh. We are connected to the internet through the cables provided by our local ISP. Most of the people now-a-days use wireless keyboards. 	4

4. [CO5]	a)	<p>Assume a packet is made only of four 16-bit words $(55E)_{16}$, $(B2)_{16}$, $(95)_{16}$, and $(DD)_{16}$. Show the checksum at the sender.</p> <p>If the second data item is changed to $(C0)_{16}$ and the last data item is changed to $(E1)_{16}$ during transmission, check if the receiver can detect any error or not.</p> <p>(Hint: The given words are in hexa-decimal value, that means, each digit can be represented by 4 bits. Remember hexadecimal values range from 0000 – FFFF).</p>	3+3
	b)	<p>What is “Taking Turns” MAC protocols? How is Polling better than CSMA/CD, state three points.</p>	4

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BRAC UNIVERSITY
Department of Computer Science and Engineering

Examination: Semester Final
Duration: 2 hours

Semester: Spring 2023
Full Marks: 50

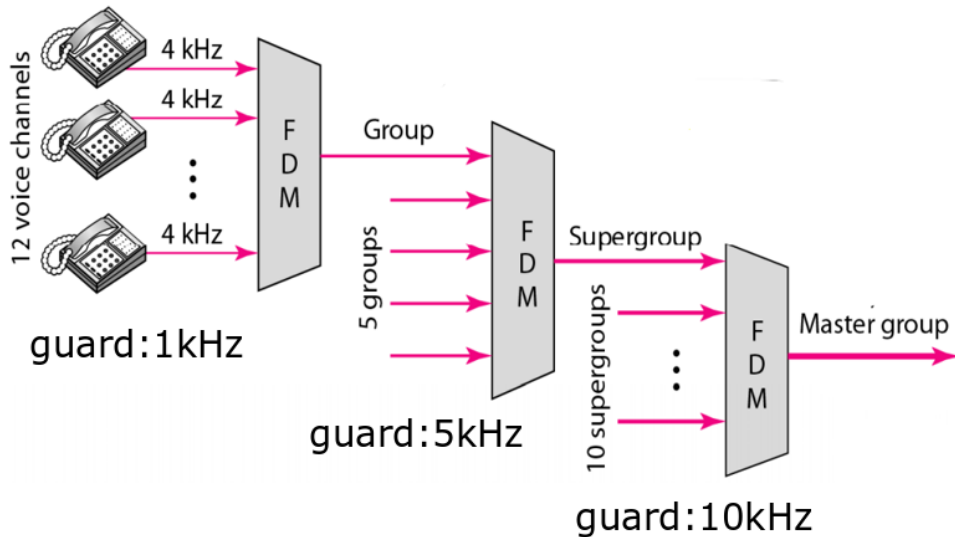
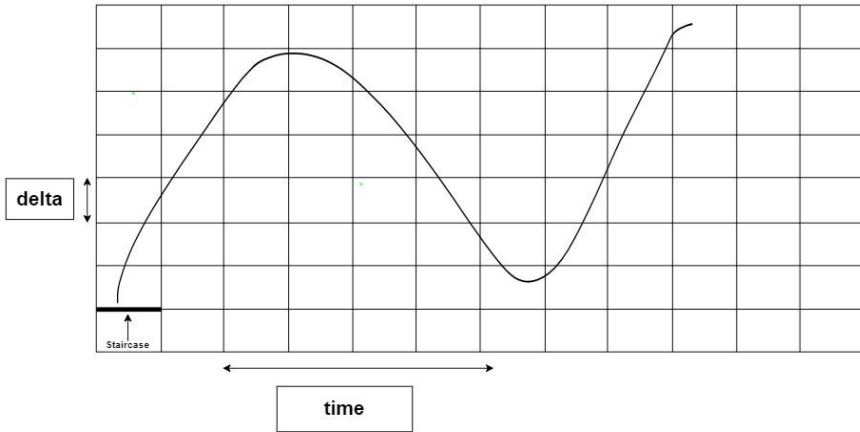
CSE 320/EEE361/ECE361: Data Communications

Answer the following questions.
Figures in the right margin indicate marks.

SET A

Name:	ID:	Section:
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1. [CO5]	a)	Assume a packet is made only of four 16-bit words $(3046)_{16}$, $(ABDC)_{16}$, $(2B5)_{16}$, and $(E30)_{16}$. I. Show the checksum at the sender. II. If the first data item is changed to $(3047)_{16}$ and the third data item is changed to $(2B4)_{16}$ during transmission, check if the receiver can detect any error in this case? III. Explain the reasons of the receiver's error detection state in (II) <i>(Hint: The given words are in hexa-decimal value, that means, each digit can be represented by 4 bits. Remember hexadecimal values range from 0000 – FFFF).</i>	6
	b)	Channelization protocols do not require any central controller to ensure multiple access resolution - True/False? Justify . How can you calculate the vulnerable time of CSMA?	4
2. [CO3]	a)	Consider , Five channels, two with a bit rate of 240 kbps and three with a bit rate of 180 kbps, are to be multiplexed with one synchronization bit. Write the following answers: I. What is the size of a frame in bits? II. What is the frame rate? III. What is the duration of a frame? IV. What is the output data rate? V. What is the output bit duration? VI. How many input channels are there after doing multiplexing?	6

	<p>b) The Following FDM hierarchy has been used by a telephone company. How many voice channels can be multiplexed together in the master group? What is the required bandwidth for the multiplexing?</p> 	4
3. [CO2]	<p>a) Show the staircase in the following graph and generate the digital data from the given analog signal using the Delta Modulation (DM) technique. You have to answer this question in the question paper only.</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0; text-align: center;">1</div>  <div style="border: 1px solid black; padding: 5px; margin: 10px 0; text-align: center;">1</div>	6
[CO4]	<p>b) Suppose, you are using fiber optic cable and you want the density of the core to remain constant from the center to the edges. Illustrate the diagram. What will the figure look like if you vary the densities?</p>	4
4. [CO5]	<p>a) List some strategies in CSMA/CA that are used to avoid collision.</p>	3

	b)	In CSMA/CD, what happens when two nodes sense the carrier at the same time? How can we stop the nodes from sensing the channel at the same time?	3											
	c)	<div>The 2 bit datawords are converted to the following 5 bit codewords. For how many bits can we successfully detect and correct errors using this scheme?</div> <table><tr><th>Dataword</th><th>Codeword</th></tr><tr><td>00</td><td>00000</td></tr><tr><td>01</td><td>01011</td></tr><tr><td>10</td><td>10101</td></tr><tr><td>11</td><td>11110</td></tr></table>	Dataword	Codeword	00	00000	01	01011	10	10101	11	11110	4	
Dataword	Codeword													
00	00000													
01	01011													
10	10101													
11	11110													
5. [CO3]	a)	What is the minimum number of bits in a PN sequence if we use FHSS with a channel bandwidth of $B = 5\text{Hz}$ and bandwidth of spread spectrum $B_{ss} = 250\text{ KHz}$?	3											
	b)	<div>Suppose, you are given with the k-bit pattern and Carrier Frequency as follows:</div> <div>k-bit pattern <table><tr><td>11 00 01 10</td></tr></table></div> <div><table><tr><th>k-bit</th><th>Carrier Frequency</th></tr><tr><td>00</td><td>100 kHz</td></tr><tr><td>01</td><td>300 kHz</td></tr><tr><td>10</td><td>400 kHz</td></tr><tr><td>11</td><td>200 kHz</td></tr></table></div> <div>Draw FHSS cycle 2 times using the above pseudo random generated k-bit pattern and given frequency table. (** Hint: Draw the Carrier frequency graph against hop period)</div>	11 00 01 10	k-bit	Carrier Frequency	00	100 kHz	01	300 kHz	10	400 kHz	11	200 kHz	4
	11 00 01 10													
k-bit	Carrier Frequency													
00	100 kHz													
01	300 kHz													
10	400 kHz													
11	200 kHz													
c)	Suppose you have two channels among which 1 channel has a bandwidth of 1500 kbps and one with 1200 kbps. What is the smartest way to multiplex these channels without involving too many extra bits? Draw and validate with visual representation to aid your reasoning.	3												

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