

Date: 15.10.2020

AHSANULLAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

Department of Computer Science and Engineering
Program: B.Sc. in Computer Science and Engineering
Semester Final Examination, Fall-2019

Part A

Year: 3rd

Course No: CSE3211

Semester: 2nd

Course Name: Data Communications

Time: 2 (Two) hours

Full marks: 40

Use Single answer script

Instructions:	i)	Answer script should be hand written and should be written in A4 white paper. You must submit the hard copy of this answer script to the Department when the university reopens.
	ii)	Write down Student ID, Course number, and put your signature on top of every single page of the answer script
	iii)	Write down page number at the bottom of every page of the answer script.
	iv)	Upload the scan copy of your answer script in PDF format at the respective site of the course at google classroom using institutional email within the allocated time. Uploading clear and readable scan copy is your responsibility and must be covered the full page of your answer script.
	v)	You must avoid plagiarism , maintain academic integrity, and ethics . You are not allowed to take any help from another individual and if taken so can result in stern disciplinary actions from the university authority

Part A

Instructions:	i)	Before uploading rename the PDF file as CourseNo_StudentID_PartNo e.g.Math2207_180107001_partA.pdf
	ii)	There are 5 (Five) Questions, Answer any 4 (Four)
	iii)	Marks allotted are indicated in the right margin
	iv)	Necessary charts/tables are attached at the end of the question paper
	v)	Assume any reasonable data if needed
	vi)	Symbols and characters have their usual meaning

Question 1. [Marks: 10]

a)	Assume that a voice channel occupies a bandwidth of 5 kHz. Show the configuration (multiplexing and demultiplexing) using frequency domain when combining 4 such channels into a link with a bandwidth of 29 +1kHz, having an upper frequency of 100 kHz. Also, note that a guard band of 3 kHz is used to prevent interference.	[4]
b)	The input power of a 40 km cable system is 2W (power at the beginning of the cable). An amplifier with a 64 dB gain is installed 24 km from the input. Find (i) the input of the amplifier and (ii)the output of the system. Note that the attenuation of the cable is 2.5 dB/ km.	[4]
c)	Draw the result of the scrambling sequence 1011000000000011 using B8ZS. Assume that the last non zero signal level has been positive.	[2]

Question 2. [Marks: 10]

a)	<p>Quadrature Phase Shift Keying (QPSK) sends two bits in each signal element. If the carrier signal is a sine wave whose three cycle periods equals to the same amount of time needed for sending two bits, draw the modulated signal graph when sending the signal 00011110 using QPSK. The phase changes for each two-bit pattern are shown in table 1.</p> <p style="text-align: center;">Table 1: Phase Changes in QPSK</p> <table><tr><th>Bits</th><th>Phase Changes (in degrees)</th></tr><tr><td>00</td><td>315</td></tr><tr><td>01</td><td>225</td></tr><tr><td>10</td><td>135</td></tr><tr><td>11</td><td>45</td></tr></table>	Bits	Phase Changes (in degrees)	00	315	01	225	10	135	11	45	[6]
Bits	Phase Changes (in degrees)											
00	315											
01	225											
10	135											
11	45											
b)	<p>Draw the constellation diagram for the situation stated in question 2a.</p>	[2]										

c)	Assume a signal is sampled. Each sample represents one of four levels. How many bits are needed to represent each sample? If the sampling rate is 8000 samples per second, what is the bit rate?	[2]
Question 3. [Marks: 10]		
a)	A voice signal having $f_{\max} = 30$ KHz and $f_{\min} = 50$ KHz is modulated using amplitude modulation. Find the carrier frequency and bandwidth of the original signal.	[2]
b)	Encode the signal '110100000000010' using differential manchester scheme assuming that the last signal level has been negative.	[4]
c)	Distinguish between synchronous and asynchronous transmissions.	[4]
Question 4. [Marks: 10]		
a)	Will the transmission of signal be affected in any way if the two cables of a twisted pair cable are arranged parallel to each other instead of twisting them? Justify your answer.	[4]
b)	In synchronous time division multiplexing, the data rate for each of the seven input connections is 64 Kbps. If a byte is multiplexed at a time, find the duration of (i) each input slot (ii) each output slot and (iii) each frame	[6]
Question 5. [Marks: 10]		
a)	Draw the original signal, spreading code and output of Direct Sequence Spread Spectrum (DSSS) when the data transmitted by original signal is 11011010 and spread code is 110111000101. Also state the chip rate when data rate is 4 bps.	[4+1]
b)	Suppose a dish antenna and a horn antenna are perfectly aligned and placed facing each other in two separate rooms of a building. Explain how the transmission of very high frequency microwave from the horn antenna will be received by the dish antenna.	[5]

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AHSANULLAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

Department of Mechanical and Production Engineering

Program: B.Sc. in Mechanical Engineering

Semester Final Examination, Fall-2019

Part-B (Open book exam)

Year: 3rd

Course No: CSE3211

Semester: 2nd

Course Name: Data Communications

Submission deadline: Next day 6.30 pm

Full marks: 20

Use Single answer script

Instructions:	i)	Before uploading rename the PDF file as CourseNo_StudentID_PartNo e.g.Math2207_180107001_partB.pdf
	ii)	Answer all the Questions
	iii)	Marks allotted are indicated in the right margin
	iv)	Necessary charts/tables are attached at the end of the question paper
	v)	Assume any reasonable data if needed
	vi)	Symbols and characters have their usual meaning

Question 1. [Marks: 10]

a)	If a low pass signal with a bandwidth of 560 KHz is sampled using 2048 levels of quantization, calculate (i) the bit rate of the digitized signal and (ii) the PCM bandwidth of the signal.	[4]
b)	Figure 1 shows eight samples obtained after sampling an analog signal whose amplitudes vary between +120V and -120V. Considering that the sampling height, $\Delta = 15$, Calculate Normalized PAM value, Normalized Quantized value and Normalized Error of the samples.	[6]

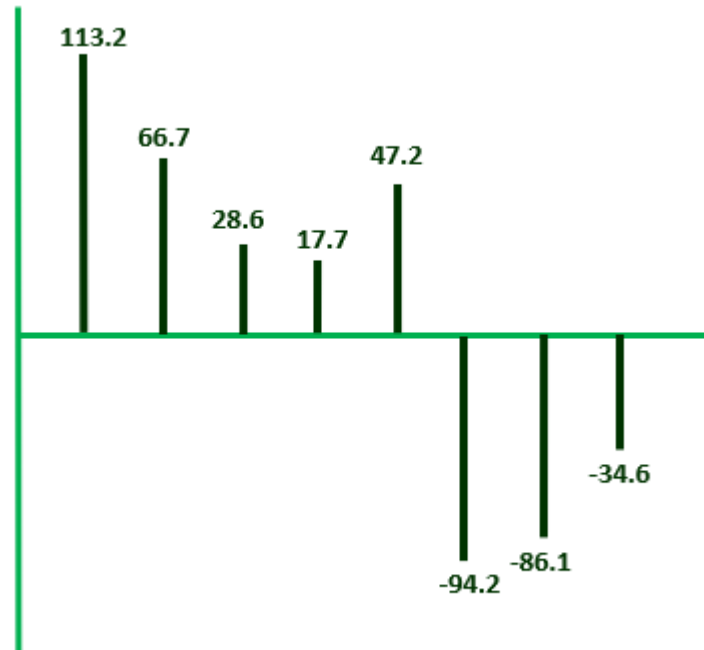


Figure 1: Samples of an analog signal

Question 2. [Marks: 10]

- | | | |
|-----------|--|------------|
| a) | Calculate the encoded word from the samples in Figure 1. | [3] |
| b) | Apply 4B/5B to the result of 2a using the 4B/5B. | [2] |
| c) | Apply 8B/6T to the result of 2b using the 8B/6T. | [5] |