

Department of Computer Science & Engineering

University of Asia Pacific (UAP)

Program: B.Sc. in Computer Science and Engineering

Final Examination

Spring 2021

3rd Year 1st Semester

Course Code: CSE 303

Course Title: Data Communication

Credits: 3

Full Marks: 120* (Written)

Duration: 2 Hours

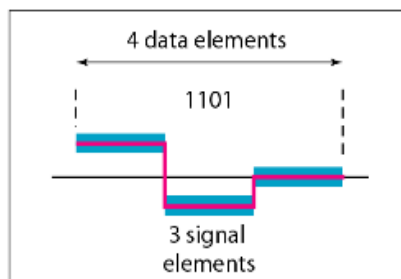
* Total Marks of Final Examination: 150 (Written: 120 + Viva: 30)

Instructions:

1. There are **Four (4)** Questions. Answer all of them. All questions are of equal value. Part marks are shown in the margins.
2. Non-programmable calculators are allowed.

1. a) Find the error, if any, in the following addresses by applying existing rules of IPV4 format. You must support your answer with proper explanation. If there is an error, rewrite it correctly, you may use any valid number in the wrong octet. If there is no error, justify whether it is a usable IP address or not. [6*2=12]
 - i) 111.086.45.78
 - ii) 1A.23.14.67
 - iii) 0.0.0.0
 - iv) 75.45.31.50.314
 - v) 121.34.7.0
 - vi) 255.255.255.255
- b) Different levels of Addresses are used in the Internet employing the TCP/IP protocols. Each address is related to a layer in the TCP/IP architecture. **Describe** the characteristics, significance of these addresses and mention the corresponding layer name where they are dealt with proper figures and outlines. [12]

c)



[6]

A signal is carrying data in which four data elements encoded as three signal elements. If the bit rate is 1000 kbps, calculate the average value of the baud rate if c is between 0 and 1?

2. a) Say, we have three rooms each having 3 PCs in a room, total of 9 PCs. Now choose a hybrid topology where you will use one kind of topology to connect the three PCs in each room and another kind of topology (as a backbone topology) to connect the three rooms. You need to draw the whole figure outlining different topologies. [8]
- b) Draw a MAC frame outlining all its fields and discuss in brief. Explain why we need a minimum/maximum length of frame? [8+4=12]
- c) “ISPs advertise bandwidth to the customers, because that value is known, and it represents the best-case scenario. But their hype about “game-changing super speeds blazing into town” may be misleading.” According to this statement **explain** the concept of Bandwidth, Latency and Throughput, and What Is Right for Your Business? (Your answer must have an example) [10]

3. a) On the basis of the following points, **list** the differences between FDM and TDM: [12]

	FDM	TDM
How the Bandwidth Is Occupied		
Signal Types		
Flexibilities		
Interferences		
Efficiencies		
Latencies		
Constructions		
Required Inputs		

- b) Five channels, each with a 200-kHz bandwidth, are to be multiplexed together. **Identify** the minimum bandwidth of the link if there is a need for a guard band of 20 kHz between the channels to prevent interference? [6]

- c) [12]

The above schematic figure depicts two types of TDM transmission. According to the figure, **analyse** how data (e.g., AA, B, C, DD) will pass from sender to receiver frame by frame.

4. a) Compare between amplitude modulation and frequency modulation. [5]
- b) A complex low-pass signal has a bandwidth of 500 kHz. Identify the minimum sampling rate for this signal? [5+5=10]

Illustrate a scenario where you cannot find a minimum sampling rate. Use necessary figures to visualize the case.

- c) You have to send a data packet X of 12 bits to your friend using 4B/5B block coding. [15]

Here X is the most significant 12 bits of the binary representation of your student ID number.

If your student ID is 19101089, the binary representation will be

1001000110111010110100001

Taking the most significant 12 bits, we have $X = 100100011011$

Note: you can get the binary representation of your student ID easily by searching online “19101089” in a decimal to binary calculator.

Apply 4B/5B block coding to identify the encoded sequence of bits that you will send to your friend.

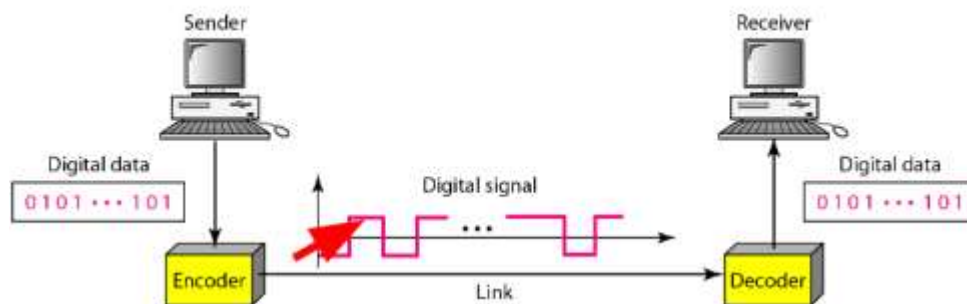
4B/5B mapping codes are given below:

Data Sequence	Encoded Sequence	Data Sequence	Encoded Sequence
0000	11110	1000	10010
0001	01001	1001	10011
0010	10100	1010	10110
0011	10101	1011	10111
0100	01010	1100	11010
0101	01011	1101	11011
0110	01110	1110	11100
0111	01111	1111	11101

OR

4. a)

[3*4=12]



You want to send a data packet Z, consisting of 8 bits to your friend.

Here Z is the least significant 8 bits of the binary representation of your student ID number.

If your student ID is 19101089, the binary representation will be

1001000110111010110100001

Taking the right most 8 bits, we have $Z = 10100001$

Construct the digital signal diagram that you will send to your friend.

Implement (if your ID is odd)

- Manchester
- 2B1Q

iii. NRZ-I

or, Implement (if your ID is even)

- i. Differential Manchester
 - ii. AMI
 - iii. Pseudoternary
- b) Compare among the three line coding schemes that you have solved in 4(a) and write down which one seems better to you? [5]
- c) A bit stream Y is transmitted using the standard CRC method. The generator polynomial is x^4+x+1 . [5+8=13]
Apply CRC method to identify the actual transmitted bit string. You need to show the full calculation for the sender side only.

Hints: Here Y is the most significant 10 bits of the binary representation of your student ID number.

If your student ID is 19101089, the binary representation will be: 1001000110111010110100001

Taking the left most 10 bits, we have $Y = 1001000110$