United International University (UIU)

Dept. of Computer Science & Engineering (CSE)

Midterm Exam Total Marks: **20** Summer-2021

Course Code: CSE 315 Course Title: Data Communications

Time: *1 hour* for answering. *Another 15 minutes* for submitting.

Any examinee found adopting unfair means will be expelled from the trimester / program as per UIU disciplinary rules.

Figures in the right-hand margin indicate full marks.

Q1

(a) The Open System Interconnection (OSI) and the Transmission Control Protocol/Internet Protocol (TCP/IP) are two main models that use the concept of protocol layering. [2+1] marks

i. With the aid of diagrams, describe step-by-step procedures how data is exchanged between two devices in the TCP/IP model.

ii. Show Layer ***vs*** Protocol mapping (in TCP/IP model) for the following protocols: TCP, IPv6, HTTPS, DNS, UDP, IMAP, SSH, OSPF, Ethernet.

(b) Design and demonstrate a computer lab where there are 3 desktop PCs (to be connected via wire) and 3 laptops (to be connected wirelessly) are networked. Identify the required devices, communication technologies, IP addresses of all computers, and transmission media to establish the lab so that it can be connected to the internet. 2 marks

Q2

(a) Briefly describe all possible transmission modes between sender and receiver. Which one of them is used by a smart phone? 2 marks

(b) Given following signals: [1+2] marks

$$x_1(t) = 20\sin(500\pi t + 40)$$
$$x_2(t) = 15\sin(200\pi t + 42)$$
$$x_3(t) = 10\sin(700\pi t + 44)$$
$$x_4(t) = \ \ 5\sin(300\pi t + 46)$$

i. Find the signal bandwidth of $x(t)$.

ii. Demonstrate the spectrum of $x(t)$ using frequency domain.

(c) Mention the three important factors having effect on data rate? Consider a noisy channel where the power of a signal is 10 mw and the power of noise is 1μw. If the channel has a bandwidth of 3162 Hz, then what will be the capacity of the channel? [1+2] marks

(d) Is there any advantage of bit stuffing over byte stuffing? If any, write down the advantage(s). 2 marks

Given an input stream 11111001111110111111. Show the procedures of bit stuffing occurs at the sender data link layer and the bit unstuffing occurs at the receiver data link layer [Given: FLAG =01111110].

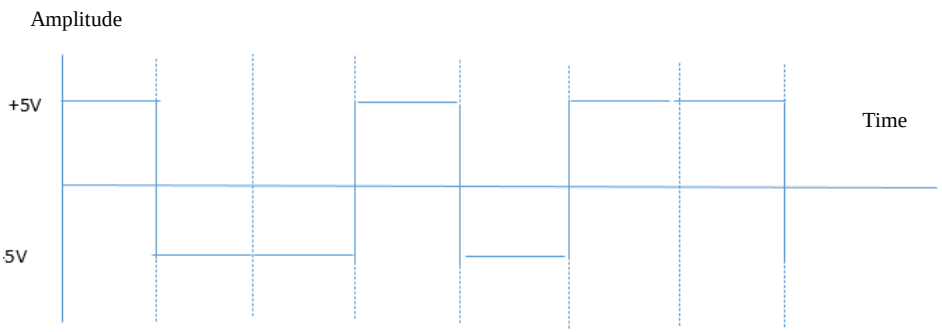
Q3

(a) Convert the 110101 bit stream using the following line coding schemes — 2 marks

i. Manchester (0 - ⌐└ 1- └⌐)

ii. Polar RZ

(b) The following signal is received in AMI scheme, then again retransmitted using NRZ-I scheme. Obtain the bit stream and draw the retransmitted siganl. — [1+2] marks



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