CS2022 ASSIGNMENT 4 (Due Date: Sep 30, 2022)

Instructions: In this assignment, there are five questions. You have to answer all of them. Put your answers in a MS WORD file, or other word processing file, and then submit the file to the course Gmail account.

Regarding Questions 5(c), 5(d) and 5(e), you could simply draw the circuits on a piece of paper. Then, you can take a photo of it and attach the image file in your answer file.

Before attaching the image in your answer file, you might need to convert its file format so that its file size is as small as possible. It is because the file size of an image could be very large if it is taken by a cell phone with very high resolution camera.

Reminder: Please double check your writing to avoid any obvious grammatical or spelling mistake.

Question 1

In the lecture note about *information systems*, it is stated that an information system is a set of interrelated components that collect (or retrieve), process, store, and distribute information to support decision making and control in an organization. The mission of an information system is to improve the performance of people in organizations through the use of information technologies.

(a) Imagine that you were living in 400 years ago. State three information systems which could be found at that time and describe what were they used for.

(b) State the information technologies which were likely used for (i) information collection, (ii) information processing, (iii) information storage and (iv) information distribution.

(c) State the information technology which was likely used for information security.

(d) With reference to today technologies, state the information technologies which are likely used for (i) information collection, (ii) information processing, (iii) information storage, (iv) information distribution and (v) information security.

(e) Explain the reason(s) why transaction processing systems are inevitable in a firm.

Question 2

In the video Amazon Fulfillment Center, each shipment box to the center will need to be scanned for its shipment information. The information of each item in the box will have to be scanned and input to the corresponding information system.

(a) Who shipped the boxes to the Amazon Fulfillment Center?

(b) In the video, the narrator has mentioned some exceptional cases under such the shipment box cannot be handled in a normal way. The box will have to be taken to other section for unpack. What are these exceptional cases?

(c) In improve the working efficiency of the workers, many technologies have been used. They include the bar code scanner, the corresponding information system and a sucker. However, many works still have to be done by the workers manually. What are they?

Question 3

(a) With reference to the ASCII table, how many bits are needed for encoding "John Sum"? Note that the open and close quotations are not included and there is a space between "John" and "Sum".

(b) What is the binary pattern for "John Sum"?

(c) What is the binary pattern for the equation "$3+x=7$"? Note that there is no space in this equation.

(d) To encode an Asian language character, how many bits are needed?

Question 4

(a) Convert the positive integer 1088_{10} (in decimal format) to 16-bit unsigned integer format.

(b) Convert the positive integer 11088_{10} (in decimal format) to 16-bit unsigned integer format.

(c) For a solid state drive (SSD) with 500GB, what is its actual memory size?

(d) Follow (c), what is the minimum number of bits for indexing all the memory slots in the SSD?

(e) If the memory address of the first memory slot is indexed as all zeros, what is the index (in decimal format) of the last memory slot?

Question 5

(a) State the truth tables for the logic gates, AND, OR, NAND, NOR and XOR. Here, it is assumed that these logic gates are two-input-one-output logic circuits. The inputs of each logic gate are denoted as X and Y. The output is denoted as Z.

(b) State the truth table for the NOT gate. Its input is denoted as X and its output is denoted as Z. Moreover, draw a logic circuit which implements an AND gate by two NAND gates.

(c) The following is the truth table of a digital logic circuit.

X	Y	Z
0	0	1
0	1	0
1	0	0
1	1	1

You are allowed to select any one of the logic gates mentioned in (a) and (b). Design a logic circuit its operation conforming to the above truth table.

(d) The following is the truth table of a digital logic circuit.

X	Y	Z
0	0	0
0	1	0
1	0	1
1	1	0

You are allowed to select any one of the logic gates mentioned in (a) and (b). Design a logic circuit its operation conforming to the above truth table.

(e) The following is the truth table of a digital logic circuit.

X	Y	Z
0	0	1
0	1	0
1	0	1
1	1	1

You are allowed to select any one of the logic gates mentioned in (a) and (b). Design a logic circuit its operation conforming to the above truth table.