Sir Syed University of Engineering & Technology
Faculty of Basic & Applied Sciences
Department of ____Computer Science____

End Semester Examinations (Spring 2020)

Course Title with Code	**CS-201: Logic Design & Switching Theory (LDST)**	**Program**	BS-CS
Instructor	**Faisal Rasheed Yazdanie**	**Semester**	3rd
Start date & Time	June 22, 2020 at 10:30 AM	**Submission Deadline**	June 22, 2020 at 04:30 PM
Maximum Marks	50		

IMPORTANT INSTRUCTIONS:

Read the following Instructions carefully:

- **Attach a scanned copy of any of your document with your date of birth on it, for instance your CNIC/PASSPORT/MATRICULATION CERTIFICATE.**
- Attempt **ALL** Questions. All questions carry equal mars.
- Attempt All Questions on MS-Word. Font theme and size must be Times New Roman and 12 points respectively. Use line spacing 1.5. Convert file to PDF format before submitting.
- You may provide answers HANDWRITTEN. The scanned solution must be submitted in PDF file format (Use any suitable Mobile Application for Scanning)
- For Diagrams, you can use paper and share a clear visible snapshot in the same Answer Sheet.
- Arrange questions and their subsequent parts in sequence.
- Make sure that your answers are not plagiarized or copied from any other sources. In case of plagiarism, **ZERO** marks will be awarded.
- Provide relevant, original and conceptual answers, as this exam aims to test your ability to examine, explain, modify or develop concepts discussed during the course.
- Recheck your answer before the submission on **VLE** to correct any content or language related errors.
- You must upload your answers via the VLE platform ONLY.

You must follow general guideline for students before online examination and during online examination which had already been shared by email and WhatsApp.

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Question 1 (a): **(4+3+3)**

A portion of a periodic digital waveform has a duty scale of X % and a pulse width of Y µs. Determine the following:

i) Period
ii) Frequency
iii) Also draw a labelled waveform with at least 3 pulses shown.

*(Hint: Here X = Your date of birth. For instance, Kelvin was born on **28**/02/**2001**, so 'X = 28' and Y = The year you were born. For instance, Kelvin was born in the year 2001, so 'Y = 2001')*

Question 1 (b):

If binary data are transferred on a USB at the rate of 'X' million bits per second (X Mbps), how long will it take to serially transfer 'Y' million bytes (MBs)?

(Hint: M = Million = Mega = 10^6. Here 'X' and 'Y' are same as in Question 1a)

Question 1 (c):

With a 'Z' MHz clock frequency, how much time is required to enter eight bits? Show all your working.

- In a serial shift register.
- In a parallel shift register.

*(Hint: Z = month you were born in. For instance, Kelvin's date of birth is 28/**02**/2001, he would say Z = 2)*

Question 2 (a): **(5+5)**

There is a machine that is operated through a logical circuit. It means, the machine can be turned ON/OFF by changing the applied inputs. There are Eight possible binary combinations that are applicable to the inputs namely X, Y, and Z.

Find the four-bit binary equivalent of the month you were born in and name that binary combination as 'A'.

(Hint: For instance, Steve was born in December, that is the twelfth month of the year, so $A = 12_{10} = 1100_2$, and if Maria was born in the month of March, so 'A' will be equal to 0011_2 for her)

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Now, identify all the binary possible comibations with exactly two High bits in each that may be applied on the inputs X, Y, and Z. Perform XOR operation between 'A' and the binary combinations with exactly two High bits in each.

(Hint: For instance, if A = 1100 and a binary combination 1010 with two High bits, so 1100 XOR 1010 = 0010)

Whatever the binary combinations are produced after performing XOR operation, the machine will turn on for those combinations, otherwise the machine will turn off.

Question 2 (b):

The expression derived in part (a), simplify it to its most minimized form by using Boolean algebra, and also draw the logic circuit of the simplified expression.

Question 3 (a): **(5+5)**

If two different input waveforms are applied to a 2-input NAND gate and the output waveform is just like one of the inputs, but inverted, what is the most likely problem?

Question 3 (b):

A bulb lights up using four switches. The bulb turns on only and only if the 4-bit binary equivalent of your birth month is applied. Draw the logic circuit using the basic logic gate(s) that must verify the given condition and show all the working.

Question 4 (a): **(5+5)**

Design a combinational circuit with *four* inputs and *one* output. The output is equal to logic: *0* when the binary value of the input is equal to 'X'. The output is logic: *1* otherwise.

*(Hint: X = Binary equivalent of the decimal digits in your date of birth. For instance: Sally was born on **29**/02/2000, so the binary values for 'X' are $2_{10} = 0010_2$ and $9_{10} = 1001_2$. And if Alex was born on **4th** of January, so he will use $0_{10} = 0000_2$ and $4 = 0100_2$)*

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Question 4 (b):

Derive a POS from the condition given in part (a), and then simplify it using Karnaugh's map to the most minimized form.

Question 5 (a): **(4+4+2)**

Two 4-bit numbers (A and B) are applied to a 4-bit parallel adder. The input carry is 1. Determine the sum (∑) and the output carry (C_{out}).

*(Hint: For instance, if Jane was born on **29/09**/2002, so A = 2+9 = 11_{10} = 1011_2 and B = 0+9 = 9_{10} = 1001_2)*

Question 5 (b):

Consider a register that can store eight bits. Assume that it has been reset so that it contains zeros in all positions. If you transfer four bits (A) serially into the register, what will the total content of the register be as soon as the fourth bit is stored?

(Hint: 'A' is same as used in part a)

Question 5 (c):

The binary numbers 'A' and 'B' are applied to the inputs of a comparator (7485). Determine the output (the relation between A and B). describe the execution steps.

(Hint: 'A' and 'B' are same as used in part a)

The END.