



National University

of Computer & Emerging Sciences Peshawar Campus



Student Name: _____

Roll No: _____

Program: **CS19**

Semester: **Spring-2020**

Time Allowed: **3 hours**

Course: **Digital Logic Design**

Examination: **Final**

Total Marks: **75** Weightage: **50**

Date: **Monday June 29th, 2020**

Instructor Name: **Shakir**

NOTE: Attempt all questions. In case of an ambiguity in a question, make an assumption, write your assumption and carry on with the question. Submit your own **hand written** solution only.

Question No. 1: Do as directed but each step must be documented

(a) $(+4F.B)_{16} - (+29.A)_{16} = (?)_{16}$ (4 marks, 5 minutes)

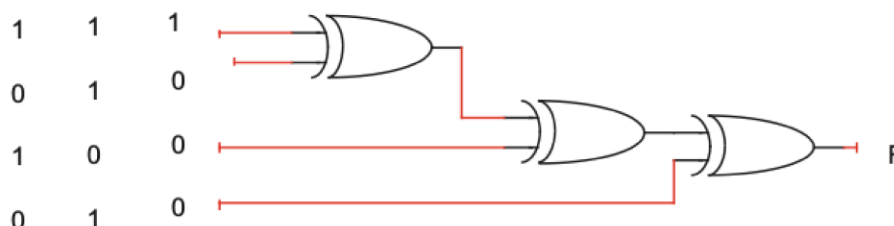
(b) $(-118)_{10} + (-32)_{10} = (?)_{10}$,
Convert each to binary using 16 bits and then add. (4 marks, 5 minutes)

(c) Both numbers are in IEEE-754 single-precision format
 $(01000001\ 10111000\ 00000000\ 00000000) +$
 $(00111111\ 01000000\ 00000000\ 00000000) = (?)_{10}$ (5 marks, 8 minutes)

(d) Multiply the signed binary numbers: $(01111111)_2$ (multiplicand) and $(00000101)_2$ (multiplier)
and Verify the multiplication is correct by converting to decimal numbers and performing the
multiplication. (4 marks, 5 minutes)

(e) Divide 00110000 by 00001100 and Verify that the process is correct by converting to decimal
numbers and performing the division. (4 marks, 5 minutes)

Question No. 2: Find the boolean expression for F and the output for each set of inputs and redraw the same
logic using AND, OR, NOT gates only. (4 marks, 15 minutes)



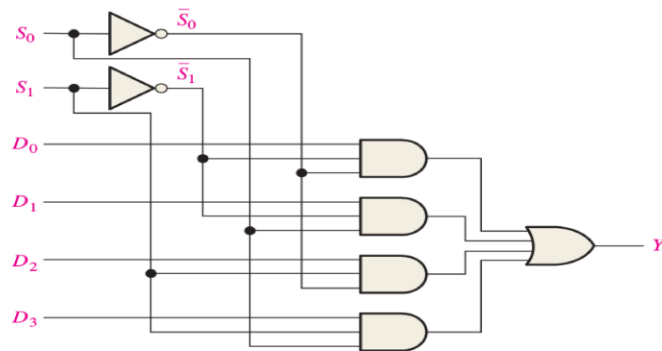
Question No. 3: Design a logic circuit with four inputs and one output; the output is one when the binary
value of the inputs is greater than or equal to the last digit of your NU registration number; otherwise the
output will be zero. You must write your name and Roll Number along with proper explanation.

(10 marks, 20 minutes)

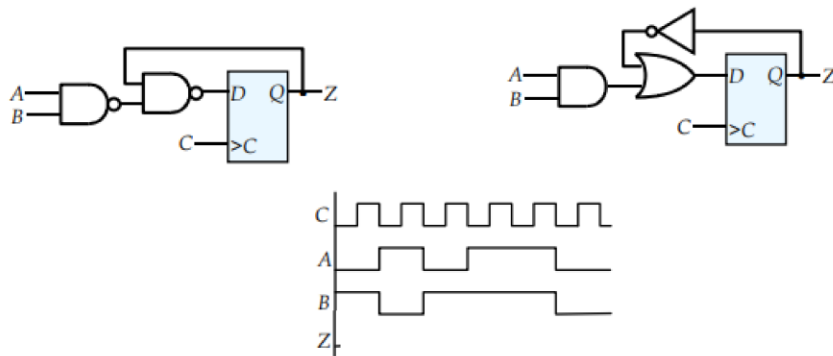
Question No. 4: For the following truth table , firstly write the two Boolean expressions for the two output variables, that is, one for X and other for Y outputs, in terms of input variables. Next simplify each function using Karnaugh mapping technique. Lastly draw the circuit. (6 marks, 10 minutes)

Input			Output	
A	B	C	X	Y
0	0	0	0	0
0	0	1	1	1
0	1	0	1	1
0	1	1	0	1
1	0	0	1	0
1	0	1	0	0
1	1	0	0	0
1	1	1	1	1

Question No. 5: Construct a timing diagram showing all inputs and the output if the S 0 and S 1 wave-forms for below circuit are 01, 00, 11, 01, 10. (4 marks, 10 minutes)



Question No. 6: Consider the sequential circuits shown below and find difference by filling in the waveform for output Z in the timing diagram. (4 marks, 5 minutes)



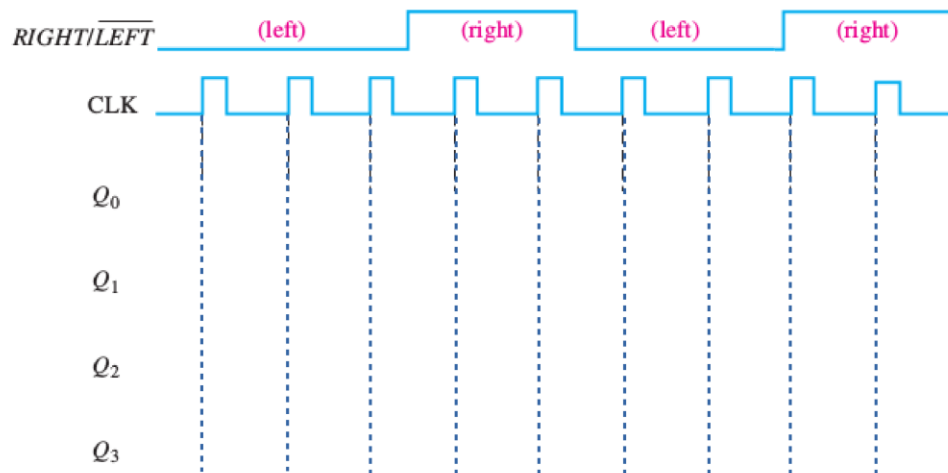
Question No. 7: Simplify the expression using the following instructions. (10 marks, 20 minutes)

$$\overline{AC}(\overline{ABD}) + \overline{ABC}\overline{D} + A\overline{BC}.$$

1. Draw the circuit before simplification.
2. use DeMorgan's theorem on the first term:
3. remove the braces of the first term
4. eliminate the first term and write the rule
5. Write appropriate rule after taking B'C common
6. Write appropriate rule after taking A'D' common
7. Draw the circuit after simplification.

Question No. 8: Find the state of the shift register of below figure after each clock pulse for the given RIGHT /LEFT control input waveform. Assume that Q₀, Q₁, Q₂, and Q₃ contains the binary value of the non-zero digit of your NU registration number from LSB and that the serial data-input line is LOW.

(4 marks, 10 minutes)



Question No. 9: Perform all steps to develop a synchronous counter to count from 1 to 9 and vice versa using J-K flip-flops. (10 marks, 30 minutes)

Question No. 10: According to American Standard Code for Information Interchange (ASCII) table, the decimal value for the symbol 'A' (Capital A) is 65, 32 for space and 97 for 'a' (small a). Write hex codes of your name registered in NU database (each starting letter must be capital).

(4 marks, 5 minutes)