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Name Surname:

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15 Jan. 2012

DIGITAL CIRCUTIS FINAL EXAM (Question 1)

Regulations:

1. Duration is 100 minutes.
2. Asking questions to proctors is not allowed.
3. Any cheating or any attempt to cheat will be subject to the University disciplinary proceedings. Cell phones are prohibited on the desk, they must be switched off.

QUESTION 1 (20 Points):

a) Minimize the following function using axioms and theorems.
f(A,B,C,D)=A'B'CD+AB'CD+AC'D+AC'D'+A'B'CD'+ABCD+ACD'

b) Write the simplest expression for the following function as product of sums. Draw the Karnaugh diagram. You do not need to use prime implicant chart.
$f(A,B,C,D)=U_1(0,1,2,3,6,8,9,10,11,14)+U_\Phi(12,15)$

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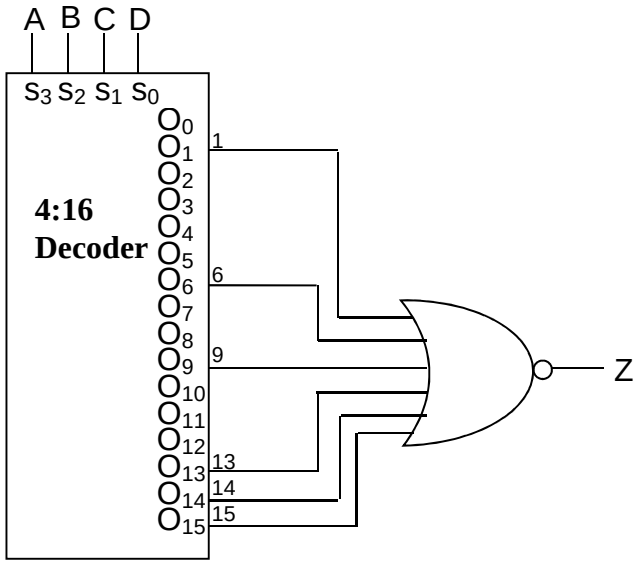
DIGITAL CIRCUTIS FINAL EXAM (Question 2)

QUESTION 2 (40 Points):
An incomplete logic function Z=f(A,B,C,D) is implemented by using a 4:16 decoder and a **NOR** gate. Don't care input values (A,B,C,D) is:**1100**



a. Draw the Karnaugh map of the function and find all prime implicants.
To show complements put a dash over literals, such as $\bar{a}$**.**

b. Construct the prime implicant chart.
The cost criteria: 2 units for each variable and 1 unit for each complement sign.

c. Simplify the prime implicant chart and find the cheapest expression of the function.

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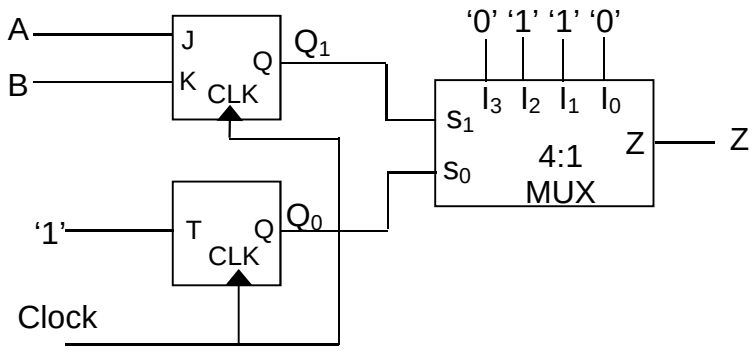
DIGITAL CIRCUTIS FINAL EXAM (Question 3)

QUESTION 3 (40 Points):

a. Analyze the given clocked synchronous circuit with two inputs (A,B) and one output (Z) and construct the State/Output table. Note: Q_1 is the most significant state variable and Q_0 is the least significant one. Show steps shortly, how you created the table.
Draw the state diagram of the circuit.



b. Design and draw the circuit with the same behavior (as in a.) by using D flip-flops and **only** 2-input NAND gates.