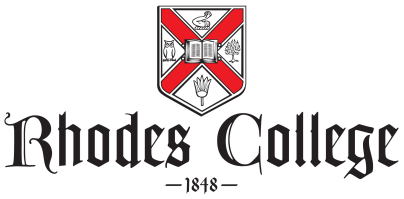
COMP 231-01
Introduction to Computer Organization
Exam Review



- Answer the following questions:

1. Convert the following to base-10:
   - A 21_3
   - B 371_17
   - C 100111_2
   - D 52_6
   - E FB_{16}
   - F 71_9
   - G $1B1_{16}$
   - H 11_2

2. Convert the following from decimal notation to the corresponding base:
   - A 533 to base 2
   - B 2062 to base 2
   - C 12 to base 2
   - D 243 to base 16
   - E 27 to base 16
   - F 5000 to base 16
   - G 11 to base 5
   - H 66 to base 3

3. Convert the following from decimal to 8-bit 2's complement:
   - A -100
   - B 32
   - C -57
   - D 67
   - E -128
   - F 128

4. Perform the following operations using 4-bit 2's complement signed arithmetic:
   - A $0110 + 1001$
   - B $1010 + 0011$
   - C $1110 + 0101$
   - D $1100 + 0111$
   - E $1011 - 1001$
   - F $0011 - 0010$
   - G $1001 - 0011$
   - H $0001 - 0110$

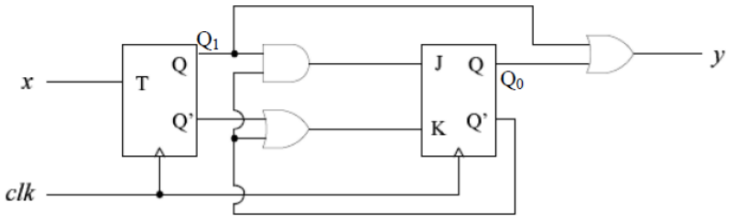
5. Consider the boolean algebra expression $F = \bar{A} * B + A * B * C$. Create a k-map for this expression and use the k-map to derive the MSOP (minimal sum of products).

6. Consider the boolean algebra expression $F = \bar{A}\bar{B}\bar{C}\bar{D} + \bar{A}\bar{B}C\bar{D} + \bar{A}BC\bar{D} + \bar{A}BCD + A\bar{B}\bar{C}\bar{D} + ABC\bar{D} + ABCD$. Create a k-map for this expression and use the k-map to derive the MSOP (minimal sum of products).

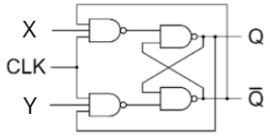
7. Create a truth table, a MSOP boolean algebra expression, and draw a circuit for a function that takes in two variables and returns 1 if the function is even and 0 if the function is odd. (For this situation, we don't care whether a zero is evaluated as even or odd.) **For this problem, use only and gates, or gates, and not gates.**

8. Create a truth table, a MSOP boolean algebra expression, and draw a circuit for a function that takes in three variables and returns 1 only if two of the inputs are 1. **For this problem, use only and gates, or gates, and not gates.**

9. Consider the following circuit, with a T flipflop and a JK flip flop. Create a characteristic table that shows what the next state will be for this circuit.



10. Consider the following circuit. What is the characteristic table for its output?



11. What is the use of a half adder? In what situation would this be used?

12. What is the characteristic table for the D flipflop?

13. Why is state S=1 R=1 undefined for an SR flipflop?

14. Is this 64-bit signed 2's complement number positive or negative?
1000011000101110111101001111100011101001111001100001101101010101

15. What is the purpose of a multiplexer?

16. What is the range of 8-bit signed 2's complement?

17. What is the difference between 1's complement and 2's complement?

18. What is a decoder used for in an ALU?

19. How do we implement memory in our circuits?

20. What is the disadvantage of a ripple-carry adder?