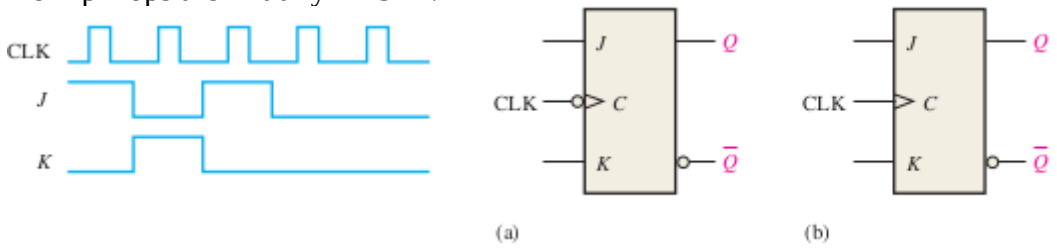
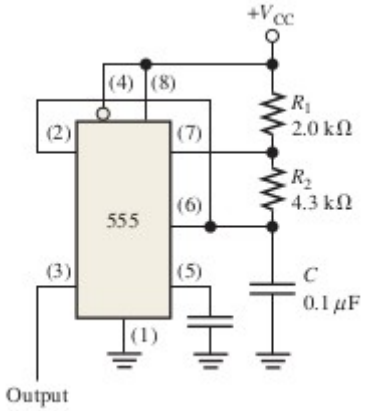
Assignments

1. Convert $(934.685)_{10}$ to base 2, 8 and 16.
2. Represent $(-469)_{10}$ to sign-magnitude, 1's complement and 2's complement for.
3. Convert the following expressions to sum-of-product (SOP) forms:
   (a) BC(C'D' + CE) (b) B + C[BD + (C + D')E]
4. Use a Karnaugh map to reduce each expression to a minimum SOP form:
   (a) A' B' C' D' + A' B' C'D + ABCD + ABCD' (b) A'B(C' D' + C'D) + AB(C'D' + C'D) + AB'C'D
5. Use The Quine-McCluskey Method to reduce each expression to a minimum SOP form:
   (a) X = ABC + A'B'C + ABC' + AB'C + A'BC (b) X = A'B'C'D' + A'B'C'D + A'BC'D + ABC'D' + AB'CD' + A'BCD' + AB'C'D
6. Develop the logic and implement the circuit necessary to meet the following requirements:
   A battery-powered lamp in a room is to be operated from two switches, one at the back door and one at the front door. The lamp is to be on if the front switch is on and the back switch is off, or if the front switch is off and the back switch is on. The lamp is to be off if both switches are off or if both switches are on. Let a HIGH output represent the on condition and a LOW output represent the off condition.
7. Design and discuss a 3 bit adder/subtractor circuit.
8. Design a combinational circuit with inputs A, B, C, D and output w, x, y, z. Assume that the inputs A, B, C, D represent a 4-bit signed number. The output is also a signed number, which is the 2's complement of the input.
9. Design a combinational circuit with three inputs, x, y, and z, and three outputs, A, B, and C. When the binary input is 0, 1, 2, or 3, the binary output is one greater than the input. When the binary input is 4, 5, 6, or 7, the binary output is one less than the input.
10. Two edge-triggered J-K flip-flops are shown in Figure. If the inputs are as shown, draw the Q output of each flip-flop relative to the clock, and explain the difference between the two. The flip-flops are initially RESET.



11. Draw and explain SR and JK master-slave flip-flop with timing diagram.
12. A 555 timer is configured to run as an astable multivibrator as shown in Figure. Determine its frequency.



13. Determine the values of the external resistors for a 555 timer used as an astable multivibrator with an output frequency of 10 kHz, if the external capacitor C is 0.004 mF and the duty cycle is to be approximately 80%.
14. A certain gate draws a dc supply current from a +5 V source of 2 mA in the LOW state and 3.5 mA in the HIGH state. What is the power dissipation in the LOW state? What is the

power dissipation in the HIGH state? Assuming a 50% duty cycle, what is the average power dissipation?

15. Discuss the operation of TTL inverter, NAND and NOR gates with proper diagram.
16. Discuss the operation of CMOS inverter, NAND and NOR gates with proper diagram.
17. What is the resolution in volts of a 10-bit DAC whose F.S. output is 5 V?
18. How many bits are required for a DAC so that its F.S. output is 10 mA and its resolution is less than 40 mA?
19. A microcontroller has an eight-bit output port that is to be used to drive a DAC. The DAC that is available has 10 input bits and has a full scale output of 10 V. The application requires a voltage that ranges between 0 and 10 V in steps of 50 mV or smaller. Which eight bits of the 10-bit DAC will be connected to the output port?
20. You need a DAC that can span 12 V with a resolution of 20 mV or less. How many bits are needed?
21. A certain eight-bit successive-approximation converter has 2.55 V full scale. The conversion time for V_A = 1 V is 80 ms. What will be the conversion time for V_A = 1.5 V?
22. Draw a monostable multivibrator circuit using 555 timer and discuss its operation.
23. An eight-bit digital-ramp ADC with a 40-mV resolution uses a clock frequency of 2.5 MHz and a comparator with V_T = 1 mV. Determine the following values.
    (a) The digital output for V A = 6.000 V
    (b) The digital output for 6.035 V
    (c) The maximum and average conversion times for this ADC
24. An eight-bit DAC produces an output voltage of 2.0 V for an input code of 01100100. What will the value of V OUT be for an input code of 10110011?