##### 1. Choose the best answer from the four choices. (20points)

1. The Boolean expression A +0 is equal to ( )

a. A b. A’ c. 0 d. 1

1. The output of an OR gate with inputs A, B, and C is a 1 when ( )

a. A=1,B=1,C=1 b. A=0,B=0,C=1 c. A=0,B=0,C=0 d. Both (a) and (b)

1. Which is correct about BCD code operation. ( )

a. 00111000 + 10000011 = 10111011 b. 11001001 + 00000001 = 11001010

c. 01001000 + 10110100 = 10000010 d. 01011001 + 00010000 = 01101001

1. *F = f(A,B) = m0+m3*, select the right answer for ( )

a.  b.  c.  d. All above

1. The following is the operation of the 2’s complement, which is correct. ( )

|  |  |  |
| --- | --- | --- |
|  | original code | complement code |
| a | 01110001 | 01111111 |
| b | 10011001 | 11100111 |
| c | 10010010 | 11101101 |
| d | 00110010 | 11001110 |

1. A J-K flip-flop with J=1 and K=1 has a 10kHz clock input, The Q output is ( )

a. constantly HIGH b. constantly LOW

c. a 5kHz square wave d. a 10kHz square wave

1. How many code groups can be received by the even parity system. ( )

10011000, 01101101, 10011011, 11111111, 01110111, 00011000

a. 2 b. 3 c. 5 d. 6

1. In general, a multiplexer has ( )

a. one data input, several data outputs, and selection inputs

b. one data input, one data output, and one selection input

c. several data inputs, several data outputs, and selection inputs

d. several data inputs, one data output, and selection inputs.

1. A modulus-16 ring counter requires ( )

a. eight flip-flops b. three flip-flops c. four flip-flops d. sixteen flip-flops

1. An asynchronous counter differs from a synchronous counter in ( ).

a. the number of states in its sequence. b. the method of clocking.

c. the type of flip-flops used. d. the value of the modulus.

##### 2. Fill in the blanks with the correct answer. (20 points)

1. (23)10 = (\_ \_)2=(\_ \_)16= ( )BCD.
2. The output of an exclusive-OR is \_\_ \_ if the inputs are same.
3. Apply DeMorgan’s theorems to the expression . The answer is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
4. If a3~a0 = 1101 and b3~b0 = 1011, the output of the 4-bit comparator is \_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_.



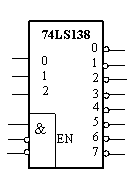
1. A modulus-5 counter has 5 states requiring \_\_\_ \_\_ flip-flops.
2. A 4-bit binary up/down counters is in the binary state of 0011. The next state in the DOWN mode is .
3. A JK flip-flop is in the toggle condition when \_\_\_\_\_\_\_\_.
4. Implement the function f(A,B)=AB’+CD by using NAND gate only, write the expression\_\_\_\_\_\_\_.

##### 3. Answer the questions briefly. (40 points)

1. Simplify the following boolean functions with K-map, and draw out the logic diagram .(8points)



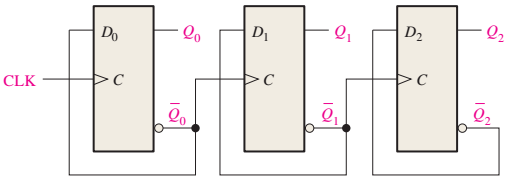
1. Draw the logic diagram for a 2-bit serial input/parallel out register. (8points)
2. Use the decoder (74LS138) to implement the function D = f(a,b,c,d) = ∑(3,5,7,9) .(8points)



1. A combinational logic circuit has two control signal C1 and C2, please implement it. (8points)

|  |  |
| --- | --- |
| C2C1 | Action |
| 00 |  |
| 01 |  |
| 10 |  |
| 11 |  |

1. For the ripple counter, show the complete timing diagram for SIXTEEN clock pulses. Show the clock, Q0, Q1, and Q2 waveforms. Assume that Q0Q1Q2 are initially LOW. (8points)



##### 4. Complete the Designs. (20 points)

1. Design a logic circuit for a sequence detector that outputs a 1 when it detects the final bit in the serial data stream 101 (the sequence can be overlapped). (10points)
2. Design a modulus-6 binary counter. (10points)