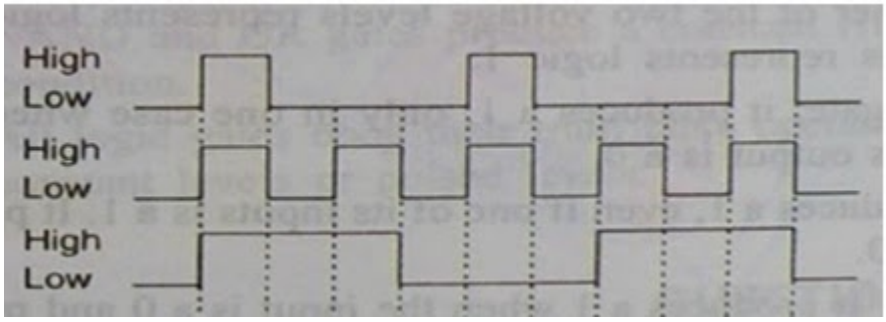
IT: Digital System Design End Sem Paper

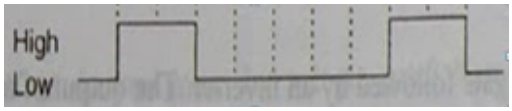
(SECTION-1) Set of 30 Questions carrying 1 mark each!

All questions are compulsory. You don't have to submit the detailed solutions of these 30 questions, just tick mark the answers.

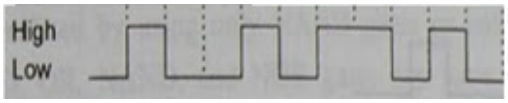
Consider the given waveforms, X, Y, and Z specified by their respective values 0 or 1 depending upon whether it is in High state or Low state. If all the three given inputs are Ex-NORed, what would be the output waveform?

1 point

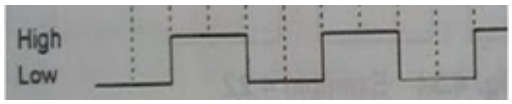




Option 1



Option 2



Option 3

Option 4

Clear selection

Identify the correct statements(s): i. Odd parity fails in detecting the situations where the bits become zero due to short-circuits or due to any fault occurrence. ii. When word is transmitted using checksums, then the sum of the transmitted words is also sent to the receiver for checking the data integrity; however, the sum can only be sent once after transmitting the whole data. iii. Using block parity, we can detect two errors in a given word whereas we can correct the two errors only if they fall in the same parity row otherwise we can correct only single error. 1 point

- ○ None of these
- ○ Option (i) only
- ○ Options(i) and (iii)
- ○ Options (i) and (ii)

If (3*512 + 6*64 + 6*8 + 5) is written in binary representation. Count the number of 1's present in the binary representation. 1 point

- ○ 10
- ○ 9
- ○ None of the above
- ◉ 8

Clear selection

What would be the 4-bit Excess-3 code of decimal number 15? 1 point

- ○ $(1100)_2$
- ○ $(1000)_2$
- ○ $(1111)_2$
- ◉ None of these

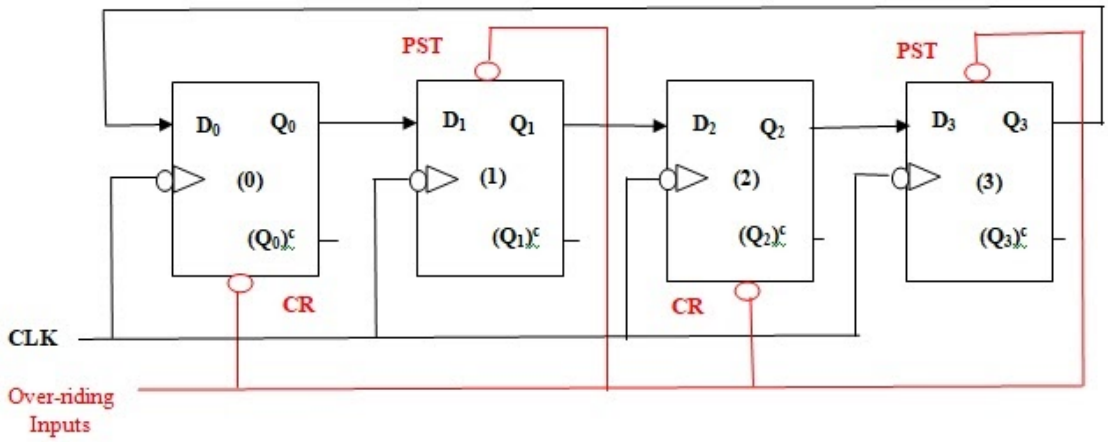
Clear selection

Suppose we want to add two unsigned binary numbers $X_{n-1}X_{n-2}$ .... X_0 and $Y_{n-1}Y_{n-2}$ ....Y_0 using a binary adder. Addition is performed using 2's complement method. The sum generated is S_{n-1} S_{n-2} .... S_0 and carry out is C_{out} . Which one of the following is the correct overflow condition? 1 point

- ◉ $Y_{n-1}X_{n-1}(S_{n-1})' + (Y_{n-1}X_{n-1})'S_{n-1}$
- ○ $Y_{n-1} \oplus X_{n-1} \oplus S_{n-1}$
- ○ $C_{out} \oplus S_{n-1}$
- ○ $C_{out}(Y_{n-1} \oplus X_{n-1})$

Clear selection

Consider the counter comprising four D-flip flops as shown in figure below. 1 point
All are connected to the system clock and would act simultaneously. Initially all the flip-flops are cleared and before any clock can trigger the flip-flops, the over-riding inputs for all the flip-flops are put in the active low mode yielding the output bit for the given flip-flops individually. Once the output from ORI has been obtained, afterward, ORI was kept in active high mode throughout the process. Now the clock would trigger the operation and would start generating the output sequence. Find the correct sequence that would get generated when ORI was low and then for the first three clock pulses.



- (0000), (1010), (0101), (1010)
- (0101), (1010), (0101), (1010)
- (0000), (0101), (0101), (0101)
- (0000), (0101), (1010), (0101)

Clear selection

Assume a new binary coded system in which every digit would be replaced by its equivalent 4-bit number while adding $(0010)_2$ for every binary equivalent of the respective digit and the base assigned to this number system is z. For example, (15)z would be equivalent to (0011 0111). Similarly find the equivalents of the following numbers: (i) (432)z (1) (1010 0011 1011) (ii) (916)z (2) (0110 0101 0100) (iii) (708)z (3) (01101000 1011) (iv) (458)z (4) (1100 0100 1001) 1 point

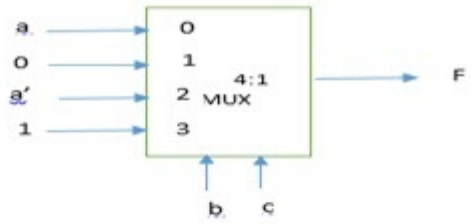
- (i) : (2), (ii) : (1), (iii) : (4), (iv) : (3)
- (i) : (3), (ii) : (1), (iii) : (4), (iv) : (2)
- (i) : (3), (ii) : (4), (iii) : (1), (iv) : (2)
- (i) : (2), (ii) : (4), (iii) : (1), (iv) : (3)

Clear selection

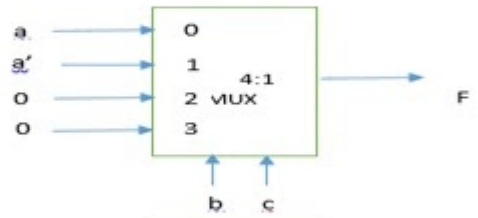
Choose the correct circuit to implement the following Boolean function. 1 point

F(a, b, c) = πM(0, 2, 3, 5, 6, 7)

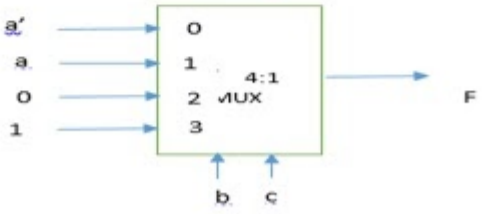
I)



II)



III)



- ○ I
- ◉ III
- ○ None of the above
- ○ II

Clear selection

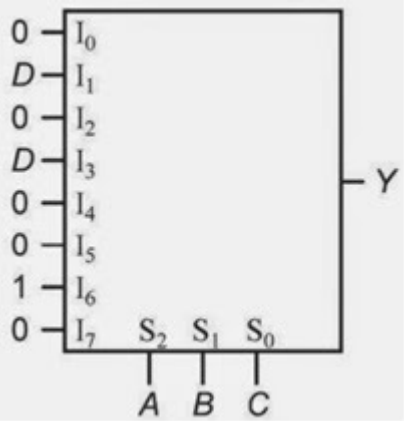
Identify the correct statement(s): (i) In case of walking ring counter, the number of states generated are twice of number of flip-flops being used out of which only half of the sates are unique and remaining are repetition of previous states. (ii) In case of ripple counter, the number of states generated are 2^(number_of_flipflops) out of which 2*n are unique and remaining are repetition of previous states. (iii) In case of ring counter, the number of states generated are equal to the number of flip-flops being used where all the generated sates are unique.

1 point

- ○ Option (iii)
- ◉ Options (i), (ii), and (iii)
- ○ Options (i) and (ii)
- ○ Option (ii)

Clear selection

Consider the following 8:1 MUX comprising 8 input lines, 1 output line along with the three select lines. What would be the minimized expression obtained on the output line, Y? 1 point



- $A\bar{B}C + \bar{A}CD$
- $AB\bar{C} + A\bar{C}D$
- $AB\bar{C} + AC\bar{D}$
- None of these

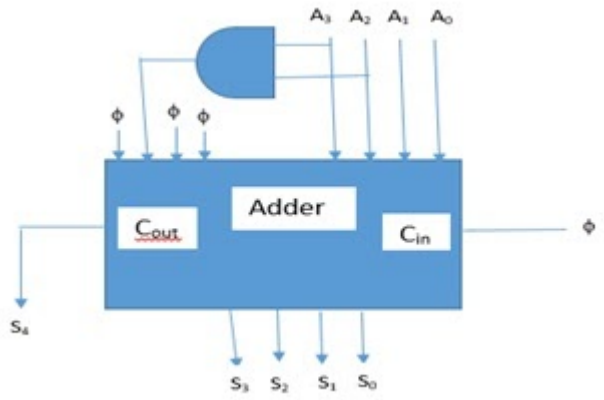
Clear selection

F= A $\oplus$ C is given, where F is a function containing three Boolean variables A, B and C. Consider the following statements: (i) F = $\sum$ (0,1,2,5) (ii) F = $\sum$ (1,3,4,6) (iii) F = π (0,2,5,7) (iv) F = π (1,3,4,6) 1 point

- Option(i) is false, option(ii) is true, option(iii) is true, option(iv) is true
- Option(i) is false, option(ii) is false, option(iii) is true, option(iv) is true
- Option(i) is true, option(ii) is false, option(iii) is true, option(iv) is true
- Option(i) is false, option(ii) is true, option(iii) is false, option(iv) is true

Clear selection

A 4 bit binary adder is shown in the figure. It has a 4 bit number A3A2A1A0 as input and a five bit number S4S3S2S1S0 as the output. Which of the following conversions is performed by this binary adder? 1 point



- (●) Binary to radix-12
- ( ) Binary to gray
- ( ) Binary to BCD
- ( ) Binary to decade

Clear selection

Due to Covid pandemic, the additional activities nowadays are being conducted in online mode and one such online classes on cooking are going to commence in the next month. However, not all are allowed to join the classes, there are some constraints to it for who can apply for attending the classes and these are: 1: Married female 30 years old or over, OR 2: A female under 30, OR 3: A married male under 30 who has no cooking skills at all, OR 4: A married male who got cooking skills, OR 5: A married male 30 years or above who has no cooking skills at all. Draw the expression, try minimizing it and eventually answer by choosing the correct option.

1 point

- ○ The candidate would be allowed if either is married or is male 30 or above.
- ○ The candidate would be allowed if either is married or is female 30 or above.
- ◉ The candidate would be allowed if either is married or is female under 30.
- ○ The candidate would be allowed if either is married or is male under 30.

Clear selection

Convert the following binary numbers to octal and then to decimal. Compare the decimal numbers obtained with the decimal numbers obtained directly from the binary numbers. Which of the following numbers yield different result? (i) 11011100.101010 (ii) 01010011.010101 (iii) 10110011

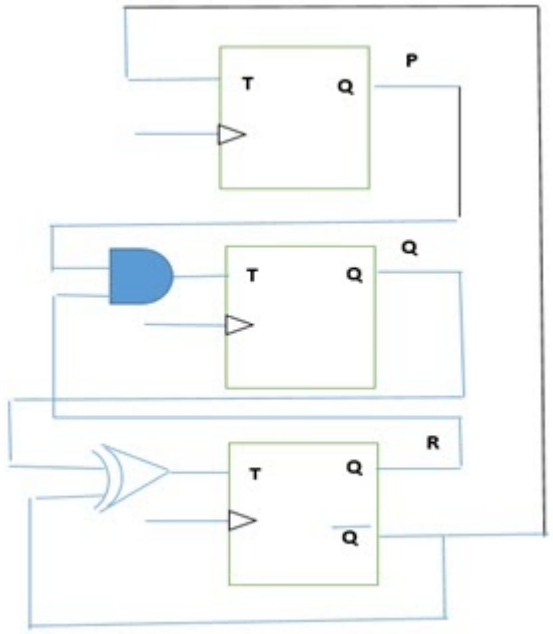
1 point

- ○ Option (i) and (ii)
- ○ Option (ii) and (iii)
- ○ Option (i), (ii) and (iii)
- ◉ None of the above

Clear selection

Consider the following circuit involving three T-type flip-flops used in a certain type of counter configuration. If at some instance prior to the occurrence of the clock edge, P, Q and R have a value 1, 0 and 1 respectively, what shall be the value of PQR after the clock edge?

1 point



- (●) 110
- ( ) 011
- ( ) 010
- ( ) 000

Clear selection

Consider a Boolean function f(a, b, c, d) such that f(1, b, 1, d) = 1, f(a, 0, 1, d) = c + d, f(0, 1, c, 0) = bc + a How many literals are present in the minimum sum-of-product expression of f? 1 point

- 5
- 3
- 4
- 6

Consider the following 4-variable K-Map with the values written in their respective cells and 'd' indicates don't care. Draw the minimized Boolean expression and mark the correct option for the minimum literal counts of the SOP as well as POS form respectively where the literal count may be defined as the sum of the number of times each literal appears in the given expression. For example, for the expression (pqr +qrs), the literal count is 6. 1 point

pq / rs	00	01	11	10
00	**d**	**1**	**0**	**1**
01	**0**	**1**	**d**	**0**
11	**1**	**d**	**d**	**0**
10	**d**	**0**	**0**	**d**

- 9 for SOP, 8 for POS
- 8 for SOP, 9 for POS
- 9 for SOP, 9 for POS
- 8 for SOP, 8 for POS

Clear selection

Consider we need to generate the stable states for the given counters. Since all the states are not required in these counters, indicate the input to the NAND Gate to connect it to the Clear pin of all the flip flops. Assume the four flips to be Q_a, Qb , Qc, and Qd where Q_a is used to generate the LSB whereas Qd will generate the MSB. (i) Mod-12 Counter (1) (Qd)(Qc)(Qb)$(Q_a)^c$ (ii) Mod-14 Counter (2) (Qd)(Qc)$(Qb)^c(Q_a)$ (iii) Mod-8 Counter (3) (Qd)(Qc)$(Qb)^c(Q_a)^c$ (iv)Mod-13 Counter (4) (Qd)$(Qc)^c(Qb)^c(Q_a)^c$

1 point

- ( ) (i) : (3), (ii) : (2), (iii) : (4), (iv) : (1)
- (•) (i) : (3), (ii) : (1), (iii) : (4), (iv) : (2)
- ( ) (i) : (4), (ii) : (2), (iii) : (3), (iv) : (1)
- ( ) (i) : (1), (ii) : (2), (iii) : (3), (iv) : (4)

Clear selection

Which of the following statements refer to a decoder? i) Has more inputs than outputs ii) Is used to convert key actuations to a binary code iii) Only one output can be activated at a time iv) Can be used to interface a BCD input to a LED display v) Can be used in parallel to serial conversion

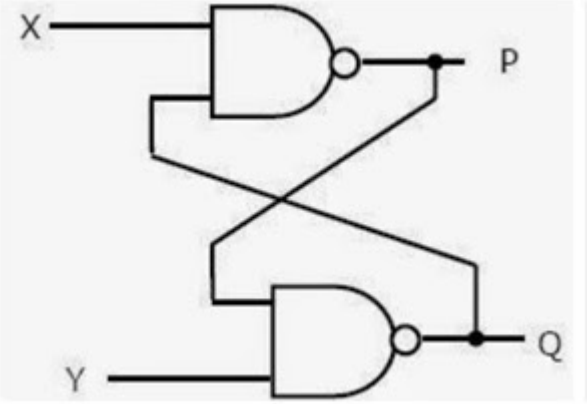
1 point

- ( ) None of the above
- ( ) options (ii), (iii), (iv)
- (•) options (iii), (iv), (v)
- ( ) options (i), (iii), (v)

Clear selection

Consider the following NAND Latch comprising input lines X and Y, along with the output obtained passed as an input in the next cycle. Match the correct answer for the given input values of X and Y. (i) X = 0, Y = 0 (1)P = 0, Q = 1 (ii) X = 0, Y = 1 (2) P = 1, Q = 0 (iii) X = 1, Y = 0 (3) [P = 0, Q = 1] OR [P = 1, Q = 0] (iv) X = 1, Y = 1 (4) P = 1, Q = 1

1 point



- (i) : (3), (ii) : (2), (iii) : (1), (iv) : (4)
- (i) : (3), (ii) : (1), (iii) : (2), (iv) : (4)
- (i) : (4), (ii) : (2), (iii) : (1), (iv) : (3)
- (i) : (4), (ii) : (1), (iii) : (2), (iv) : (3)

Clear selection

Consider a 7-bit data that has to be first stored in the Shift Right Shift Register (SRSR) comprising 7 D-flip-flops and then all the bits must be retrieved as an output for further processing. Indicate the number of clock pulses required in case of various registers: (i) SISO Register (1) 1 clock pulse (1 for input / output both) (ii) SIPO Register (2)7 clock pulses (1 for input/7 for output) (iii)PISO Register (3) 7 clock pulses (7 for input / 1 for output) (iv)PIPO Register (4) 13 clock pulses (7 for input / 7 for output) 1 point

- (i) : (4), (ii) : (2), (iii) : (3), (iv) : (1)
- (i) : (3), (ii) : (4), (iii) : (1), (iv) : (2)
- (i) : (4), (ii) : (3), (iii) : (2), (iv) : (1)
- (i) : (2), (ii) : (3), (iii) : (1), (iv) : (4)

Clear selection

Assume 3-to-8 line decoders available to you with their enable input lines, there would be the need of _____ number of 3-to-8 line decoders for constructing the 8-to-64 line decoder without making use of any other logic gate explicitly. 1 point

- This decoder cannot be constructed.
- 9
- 6
- 8

Clear selection

Given the following K-Map, identify which of the following groups of minterms are not prime implicants: (i) m8, m9 (ii) m11,m15 (iii) m0,m8 (iv) m3, m11 (v) m3 , m7 (vi) m1,m3 (vii) m9,m11 (viii) m1,m9

1 point

AB / CD	00	01	11	10
00	1			1
01	1			1
11	1	1	1	1
10				

- (●) All of the above
- ( ) { vi , vii , viii}
- ( ) { ii, i , iii, iv}
- ( ) {i, v, viii)

Clear selection

Consider a half subtractor with P as subtrahend, and Q as minuend, when processed the value of borrow indicated by R and difference indicated by S are _____ and _____ respectively.

1 point

- (●) R = $P\bar{Q}$ + $\bar{P}Q$, S = $P\bar{Q}$
- ( ) R = $\bar{P}Q$, S = $P\bar{Q}$ + $\bar{P}Q$
- ( ) R = $P\bar{Q}$, S = $P\bar{Q}$ + $\bar{P}Q$
- ( ) R = $P\bar{Q}$ + $\bar{P}Q$, S =$\bar{P}Q$

Clear selection

Match the radix of the given number systems? (i) Binary (1) Sixteen (ii) Decimal (2) Two (iii) Hexadecimal (3) Eight (iv) Octal (4) Ten 1 point

- (i)-(2), (ii)-(1), (iii)-(3), (iv)-(4)
- (i)-(2), (ii)-(4), (iii)-(3), (iv)-(1)
- (i)-(4), (ii)-(2), (iii)-(1), (iv)-(3)
- (●) None of these

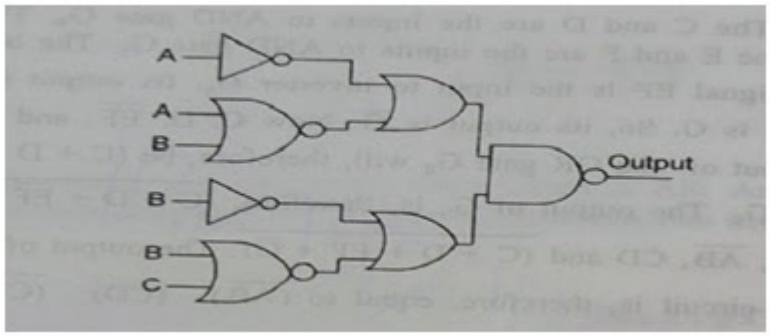
Clear selection

Identify the appropriate options for the following statements regarding the base they can have? (i) Given the two numbers in any number system, A= 2130 and B = 3654, whose sum is 5784. (ii) Given $(50)_{10}$ = (200)x. Identify the base x. 1 point

- (i) base = 9, (ii)cannot be predicted
- (i) base >= 8, (ii)x=5
- (i) base = 8, (ii) x= 10
- (●) None of these

Clear selection

Obtain the minimized expression for the given circuitry: 1 point



- 1
- $\bar{A}$+B
- None of these
- A+$\bar{B}$

Clear selection

Identify the correct statement(s): (i)The binary number $(11001)_2$ is equivalent to the 2s complement representation of decimal number $(-9)_{10}$. (ii) The binary number $(111001)_2$ is equivalent to the 2s complement representation of decimal number $(-25)_{10}$.(iii) The binary number $(1001)_2$ is equivalent to the 2s complement representation of decimal number $(-7)_{10}$. 1 point

- Option (iii)
- Option (i), and (ii)
- Option (i), (ii), and (iii)
- None of these

Clear selection

Which of the following bit sequence will be generated by the following configuration: (i) A positive edge triggered T flip flop is connected to a positive edge triggered JK flip flop. (ii) The complemented output of T flip flop is connected to both inputs J and K of JK flip flop. (iii) The output of JK flip flop is provided as feedback to T flip flop. (iv) Initially, the output of T flip flop is set to logic 1 and output of JK flip flop is cleared. (v) Both flip flops are connected to a common clock. 1 point

- 10101010
- 10001010
- 10110011
- 11001100

Consider 8-4-2-1 BCD code indicated as Y8Y4Y2Y1.This BCD Code has been fed as an input to a circuitry that generates one as an output if (Y8=0,Y4=0, and Y2=1) or (Y8=0 and Y4=1). Find its equivalent expression. 1 point

- ∑ m(2,3,4,5,6,7) . d (10,11,12,13,14,15)
- ∑ m(2,3,4,5,6,7) + d (10,11,12,13,14,15)
- π M(2,3,4,5,6,7) . d (10,11,12,13,14,15)
- π M(2,3,4,5,6,7) + d (10,11,12,13,14,15)

Clear selection

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