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Continuous Assessment Test – I

Programme Name & Branch: B.Tech & CSE

Course Name & Code: Digital Logic and Design & CSE1003

Class Number: **Slot:C1+TC1**

Exam Duration: 90 minutes **Maximum Marks: 50**

Faculty Name :

Answer all the questions (5 X 10 =50)			
S.No.	**Question**	**Marks**	**Course Outcome (CO)**
1.	**i.** Find out the following problem answer as overflow / underflow / correct result? a. Let **A=69** and **B=90**. If A and B are unsigned decimal 8-bit integers, then what is the result of **A-B**? b. Let **A=69** and **B=90**. If A and B are sign and magnitude 8-bit integers, then what is the result of **A+B**? (Note: Need Justification for the your result) Answer : under flow, overflow **ii.** What is the radix of the number hold by the equation **312/20 = 13.1**? Answer 5 **iii.** Compute $\mathbf{(FACE)_{16} / (12)_{16}}$ **Answer :** EX: DEF $12\overline{)FACE}$ EA 10C FC 10E 10E 0 12 × D = EA FA – EA = 10 12 × E = 10C 10C – FC = 10 12 × F = 10E **iv.** Convert to base 6: $\mathbf{3BA.25_{14}}$ **Answer**	2 2 2 2 2	1

$(3BA.25)_{14} = 3*14^2 + 11*14^1 + 10*14^0 + 2*14^{-1} + 5$
$= (752.1684)_{10}$

752 / 6 = 125 R=2
124 / 6 = 20 R=5
20 / 6 = 3 R=2
3 / 6 = 0 R=3
➔ 3252
.1684 * 6 = 1.0104
.0101 * 6 = 0.0624
.0624 * 6 = 0.3744
.3744 * 6 = 2.2464
➔ $(3252.1002)_6$

v. The state of a 12-bit register is 100010010111. What is its content if it represents

a. Three decimal digits in the excess-3 code?
b. Three decimal digits in BCD?

Answer :
a. 564 b. 897

Decimal Digit	BCD	Excess-3	8,4,−2,−1
0	0000	0011	0000 (0+0−0−0=0)
1	0001	0100	0111 (0+4−2−1=1)
2	0010	0101	0110 (0+4−2−0=2)
3	0011	0110	0101 (0+4−0−1=3)
4	0100	0111	0100 (0+4−0−0=4)
5	0101	1000	1011 (8+0−2−1=5)
6	0110	1001	1010 (8+0−2−0=6)
7	0111	1010	1001 (8+0−0−1=7)
8	1000	1011	1000 (8+0−0−0=8)
9	1001	1100	1111 (8+4−2−1=9)

2.	I. A burglar alarm is designed so that it senses four input signal lines. Line A is from the secret control switch, line B is from a pressure sensor under a steel safe in a locked closet, line C is from a battery-power clock, and line D is connected to a switch on the locked closet door. The following conditions produce logic 1 voltage on each line.	6	3

A : The control switch is closed.

B : The safe is in its normal position in the closet.

C : The clock is between 10:00 and 14:00 hours.

D : The closet door is closed.

Write the expression and draw the logic circuit using only minimal NAND Gate for the burglar alarm that produces a logic-1 (rings a bell)

when the safe is moved and the control switch is closed, or when the closet is opened after banking hours, or when the closet is opened with the control switch open.

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Answer :

A' =control switch open B' =moved C'= After D'=closet open Z(A,B,C,D) = AB ′ + C ′ D ′ + A ′ D

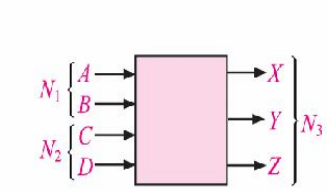
abcd	z
0000	1
0001	0
0010	1
0011	0
0100	1
0101	0
0110	1
0111	0
1000	1
1001	1
1010	1
1011	1
1100	1
1101	0
1110	0
1111	0

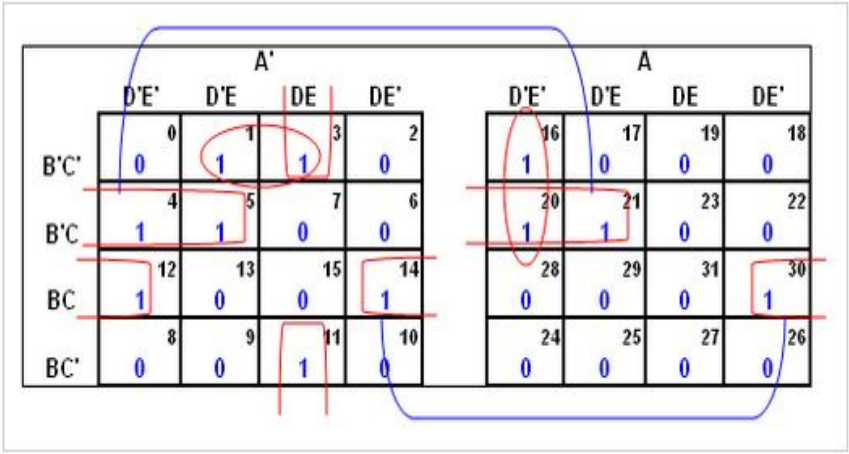
II. Identify what type of gate is represented by each of the following phrases:

•Any low input guarantees a high output.

•Any high input guarantees a low output.

	•Any high input guarantees a high output. •Any difference in the inputs guarantees a high output. •Any difference in the inputs guarantees a low output. Answer : Any low input guarantees a high output:NANDgate. •Any high input guarantees a low output:NORgate. •Any high input guarantees a high output:ORgate .•Any difference in the inputs guarantees a high output:XORgate. •Any difference in the inputs guarantees a low output:XNORgate		
3.	I. Simplify the following Boolean functions using Boolean properties into a minimum number of literals and draw the logic circuit for the minimized expression using basic gates **F(A,B,C) = [AB+A'D'+BD'+A'B+CD'A+A'D+CD+A'B'D']'** $f(A,B,C,D) = \overline{AB+\bar{A}\bar{D}+B\bar{D}+\bar{A}B+C\bar{D}A+\bar{A}D+CD+\bar{A}\bar{B}\bar{D}}$ [T6a] $= \overline{B+\bar{A}\bar{D}+B\bar{D}+C\bar{D}A+\bar{A}D+CD+\bar{A}\bar{B}\bar{D}}$ [T4a] $= \overline{B+\bar{A}\bar{D}+C\bar{D}A+\bar{A}D+CD+\bar{A}\bar{B}\bar{D}}$ [T6a] $= \overline{B+\bar{A}+C\bar{D}A+CD+\bar{A}\bar{B}\bar{D}}$ [T4a] $= \overline{B+\bar{A}+C\bar{D}A+CD}$ [T5a] $= \overline{B+\bar{A}+C\bar{D}+CD}$ [T6a] $= \overline{B+\bar{A}+C}$ [T8a] $= \bar{B}A\bar{C}$ Find the combinational circuit and design an adder which adds two 2-bit binary numbers to give a 3-bit binary sum.	6 4	3 2

	 Truth Table : N_1 A B; N_2 C D; N_3 X Y Z 0 0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 1 0 0 1 0 0 0 1 1 0 1 1 0 1 0 0 0 0 1 0 1 0 1 0 1 0 0 1 1 0 0 1 1 0 1 1 1 1 0 0 1 0 0 0 0 1 0 1 0 0 1 0 1 1 1 0 1 0 1 0 0 1 0 1 1 1 0 1 1 1 0 0 0 1 1 1 1 0 1 1 0 0 1 1 1 0 1 0 1 1 1 1 1 1 1 0 II. Covert the expression **F=x'+x(x+y')(y+z')** into Standard Form (**SOP, POS),** Canonical Form **(SOM and POM)**. Answer SOP and POS **(b)** $x' + x(x + y')(y + z') = (x' + x)[x' + (x + y')(y + z')]$ $= (x' + x + y')(x' + y + z')$ $= x' + y + z'$		
4.	Simplify the following Boolean function into **minimum SOP** expression using **Karnaugh map** **F(A,B,C,D,F) =** **∏(0,2,6,7,8,9,10,13,15,17,18,19,22,23,24,25,26,27,28,29,31)**	10	2

	 **F = B'CD' + A'BCE' + BCDE' + A'C'DE + AB'D'E' + A'B'C'E**		
5.	Reduce the following Boolean expression using **Quine–McCluskey tabular method** and find the **prime and essential implicants** **F(A,B,C,D,E) = ∏ (2,3,7,10,12,15,27) + d(5,18,19,21,23)**	10	2

List 1			List 2			List 3		
Minterm	$ABCDE$		Minterms	$ABCDE$		Minterms	$ABCDE$	
2	00010	√	2, 3	0001-	√	2, 3, 18, 19	-001-	PI_1
3	00011	√	2, 10	0-010	PI_4	3, 7, 19, 23	-0-11	PI_2
5	00101	√	2, 18	-0010	√	5, 7, 21, 23	-01-1	PI_3
10	01010	√	3, 7	00-11	√			
12	01100	PI_7	3, 19	-0011	√			
18	10010	√	5, 7	001-1	√			
7	00111	√	5, 21	-0101	√			
19	10011	√	18, 19	1001-	√			
21	10101	√	7, 15	0-111	PI_5			
15	01111	√	7, 23	-0111	√			
23	10111	√	19, 23	10-11	√			
27	11011	√	19, 27	1-011	PI_6			
			21, 23	101-1	√			

$$f(A, B, C, D, E) = PI_1 + PI_4 + PI_5 + PI_6 + PI_7$$

or

$$f(A, B, C, D, E) = PI_2 + PI_4 + PI_5 + PI_6 + PI_7$$

	√ 2	3	√ 7	√ 10	√ 12	√ 15	√ 27
PI_1	×	×					
PI_2		×	×				
PI_3			×				
** PI_4	×			⊗			
** PI_5			×			⊗	
** PI_6							⊗
** PI_7					⊗		