Digital Logic & Design
Program: BS.SE
Instructor: Muhammad Amin
Examination: MID TERM
SEMESTER: MID Term (summer)
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ID: 13579

Question No: 1

Convert each of the following:

(a) $45.25_{10} = (?)_2$

Solution:

45	2				
44	22	2			
1	-22	11	2		
	0	-10	5	2	
		1	-4	2	2
			1	-2	1
				0	

$45_{10} = 101101_2$ → (1)

The fractional part: 0.25_{10}

0	.25
.	2
0	5
	2
1	0

$0.25_{10} = 0.01_2$ → (2)

Add equ (1) & (2)

$101101_2 + 0.01_2 = 101101.01_2$

Hence:

$$45.25_{10} = 101101.01_2$$ Answer.

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Q1 (b)

$01111111.1010_2 = (?)_{10}$

Sol:

$= 0.2^7 + 1.2^6 + 1.2^5 + 1.2^4 + 1.2^3 + 1.2^2 + 1.2^1 + 1.2^0 + 1.2^{-1} + 1.2^{-2} + 1.2^{-3} + 0.2^{-4} =$

$0 + 64 + 32 + 16 + 8 + 4 + 2 + 1 + 0.5 + 0 + 0.125 + 0 =$

127.625_{10}

$01111111.1010_2 = 127.625_{10}$ Answer

(c)

(i) $3A6F_{16} = (?)_2$

Solution:

$3A6F_{16} = 3.16^3 + 10.16^2 + 6.16^1 + 15.16^0 = 14959_{10}$

Converting: 14959_{10}

14959	2												
-14958	7479	2											
1	7478	3739	2										
	1	3738	1869	2									
		1	-1868	934	2								
			1	934	467	2							
				0	466	233	2						
					1	232	116	2					
						1	116	58	2				
							0	58	29	2			
								0	28	14	2		
									0	14	7	2	
										0	6	3	2
											1	2	1
												1	

$3A6F_{16} = 1110100110111_2$ Answer

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(d) $10101010_2 = \pm (?)_{10}$

Sol:

$$10101010_2 = 1\cdot2^7+0\cdot2^6+1\cdot2^5+0\cdot2^4+1\cdot2^3+0\cdot2^2+1\cdot2^1+0\cdot2^0$$

$$= 170_{10}$$ Decimal Answer

Now

By Converting 170_{10} in Binary-Decimal system

$170_{10} = 1\ 7\ 0 = 11110_{2\text{-}10}$

$=1 \quad =111 \quad =0$

$10101010_2 = 11110_{2\text{-}10}$ Answer

(e)

(e) $-1_{10} = (?)_2$

Sol:

By Converting

$-1_{10} = -1_2$

Ans

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(f) $156_{10} = (\quad)_{BCD}$

S.l:

Convert by Decimal to Hexadecimal

156	16
-144	9
12 = C	

$$\boxed{156_{10} = 96_{16}}$$ 9C Answer

(g)

(g) $1001010_2 = (\quad)_{grey}$

Solution:

1001010_2

A	A ⊕ B	
0	0	0
0	1	1
1	0	1
1	1	0

Grey Code is = 1101111

$$\boxed{1001010_2 = 1101111_{grey}}$$ Answer

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(h) 111000 = (?101001) even parity

solution

111000 = [1]101001

even parity

Question No: 2

Q2. Calculate each of the following

(a) $9B_{16} + 8A_{16}$

9B + 8A = 125 Ans

(b)

$F7_{16} - D6_{16}$

Sol:

F7 - D6 = 21 Answer

Decimal value

247 - 214 = 33

(c) $1100_2 + 1011_2$ (use modulo-2).

Solution:

The result is

1

Answer

A + B	SUM	Carry
0 + 0	0	0
0 + 1	1	0
1 + 0	1	0
1 + 1	0	1

= = = =

(d) $01111111_2 - 00000111_2$ (use 2's complement

Solution:

A = 01111111, B = 00000111

A - B = ? using 2's compliment

2's Complement of B = 00000111

```
  1 1 1 1 1 1 1 1
- 0 0 0 0 0 1 1 1
  1 1 1 1 1 0 0 0
```

Now add it with 1 B to A

```
  1 1 1 1 1 1 1 1        1 1 1 1 1 1 1 1
+ 0 1 1 1 1 1 1 1      0 1 1 1 1 1 1 1
  1 0 1 1 1 1 0 0 0    + 1 1 1 1 1 0 0 1
                       1 0 1 1 1 1 0 0 0
```

The Answer is [0 1 1 1 1 0 0 0 0] Ans

BABAR

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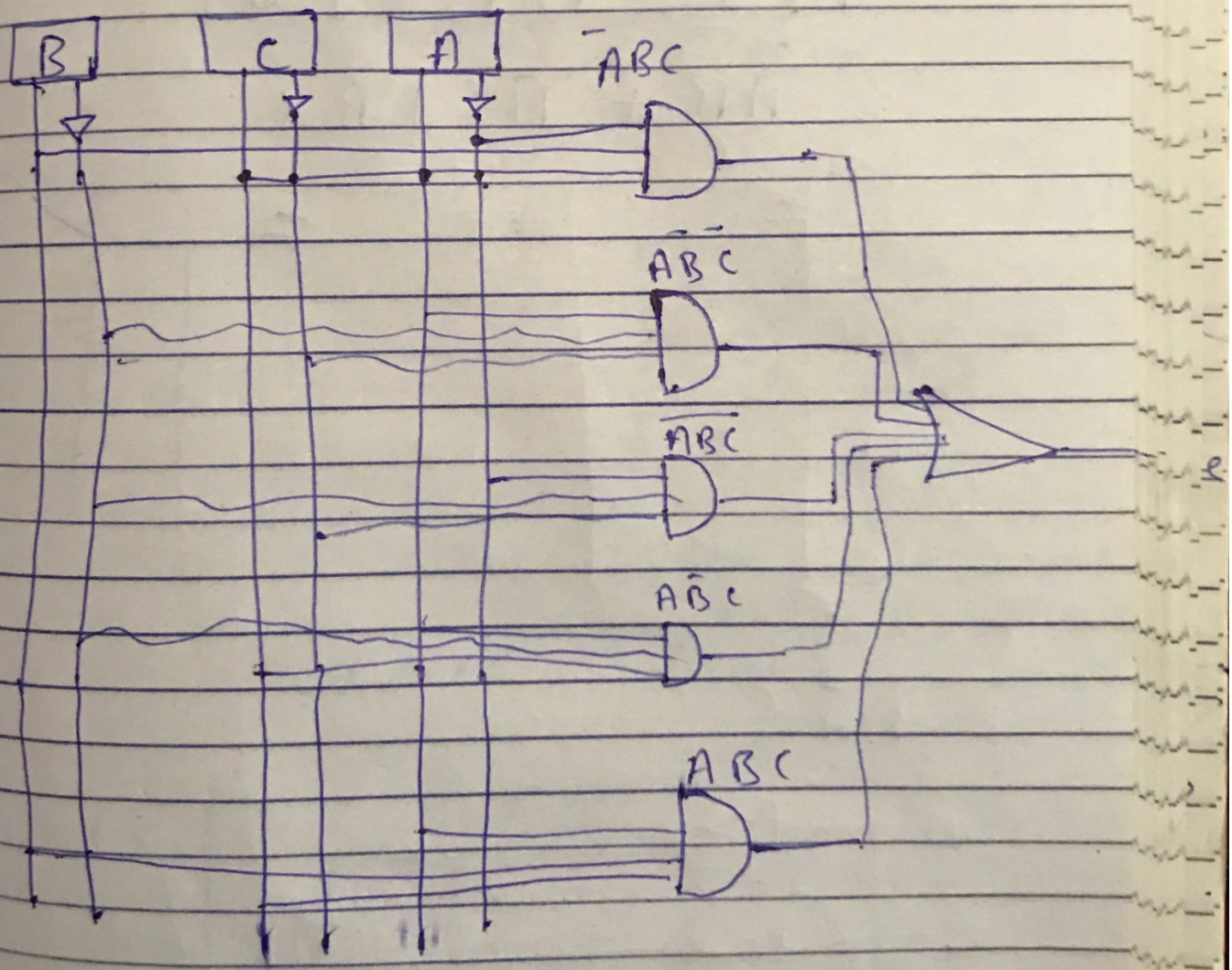
Question No: 4

(01)

Draw the logic circuit for the following expression:

$X = \bar{A}BC + A\bar{B}C + AB\bar{C} + A\bar{B}\bar{C} + ABC$



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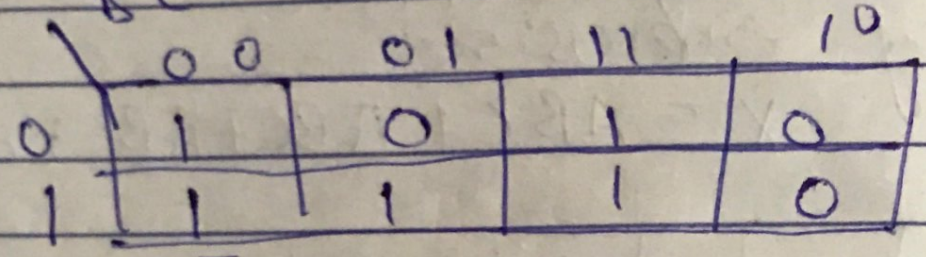
Q 4 (b)

Use Boolen algebra of part (a)



$AB + AC + BC$

$= \quad = \quad =$

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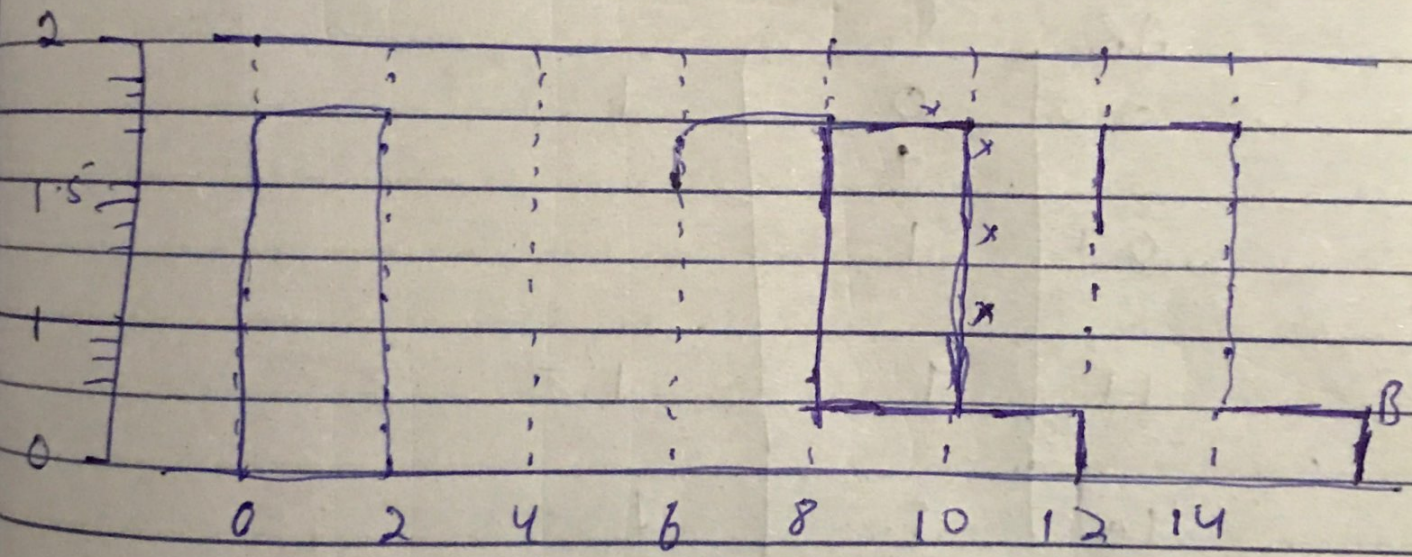
Question No: 3

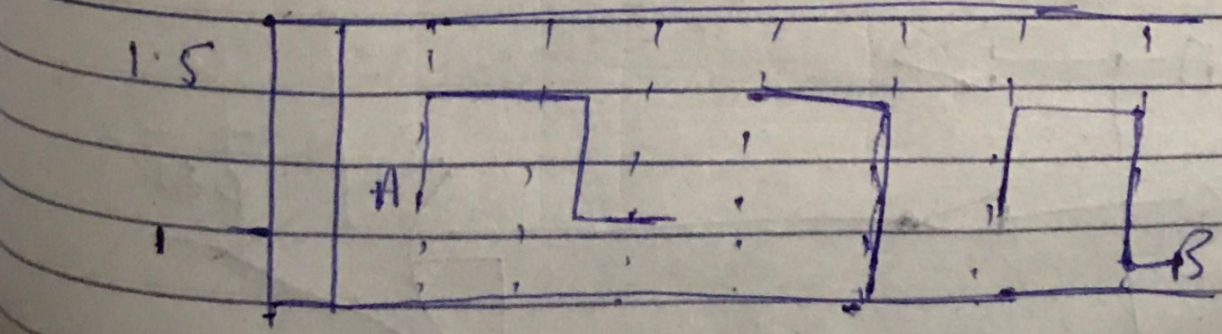
Determine the output waveforms for the NOR and XNOR gates given the input waveforms, A & B in the

XOR

waveforms



XNOR



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Question No 6

(a)

$X = \bar{A}\bar{B}\bar{C} + A\bar{B}\bar{C} + \bar{A}B\bar{C} + AB\bar{C} + ABC + A\bar{B}C$

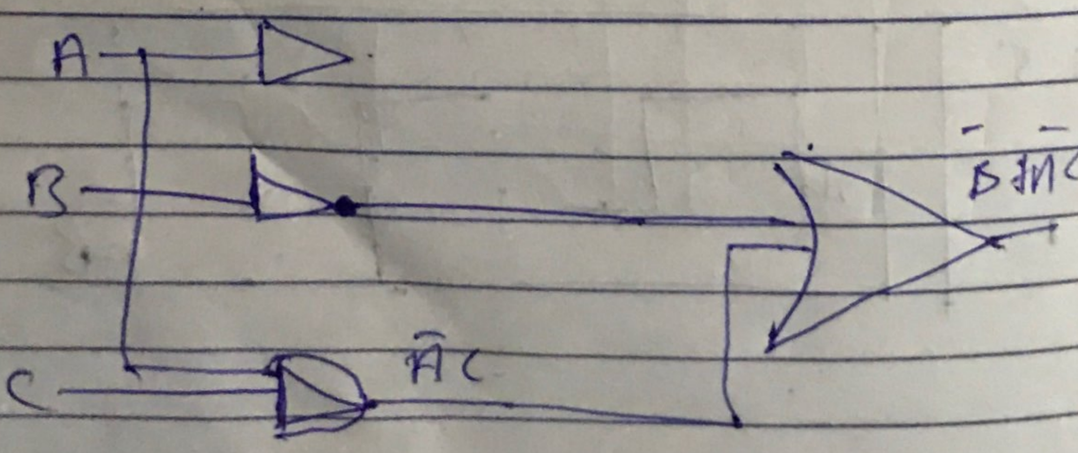
S.l :

$\bar{A}\bar{B}\bar{C} + A\bar{B}\bar{C} + \bar{A}B\bar{C} + AB\bar{C} + ABC + A\bar{B}C$

000 100 010 110 111 101

AB \ C	0	1
00	0 / 1	1
01	1	
11	1	1
10	1	1

$\bar{B} + \bar{A}C$



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Question No: 5

Convert the following expression

(a)

$A = x + y + z$

$x + y + \bar{z}$

$1 + 1 + 0$

$= 1$ Ans

= = = =

Part (b)

POS

$x + y + z$

$\bar{x} \cdot \bar{y} \cdot \bar{z}$

$1 \cdot 1 \cdot 0$

$= 0$ Ans

(c)

SoP

x	y	z	$\bar{z}$	
0	0	0	1	1
0	0	1	0	1
0	1	0	1	1
0	1	1	0	1
1	0	0	1	1
1	0	1	0	1
1	1	0	1	1
1	1	1	0	1

PoS

x	y	z	$\bar{z}$	
0	0	0	1	0
0	0	1	0	0
0	1	0	1	0
0	1	1	0	0
1	0	0	1	0
1	0	1	0	0
1	1	0	1	1
1	1	1	0	1

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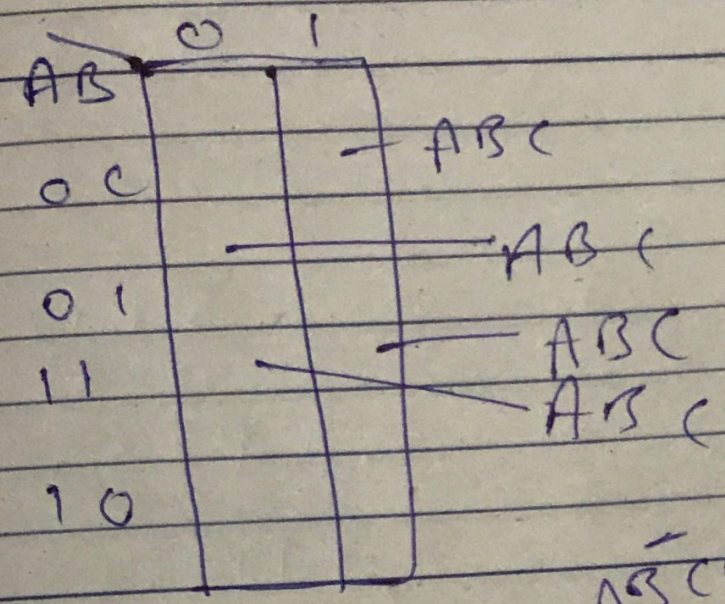
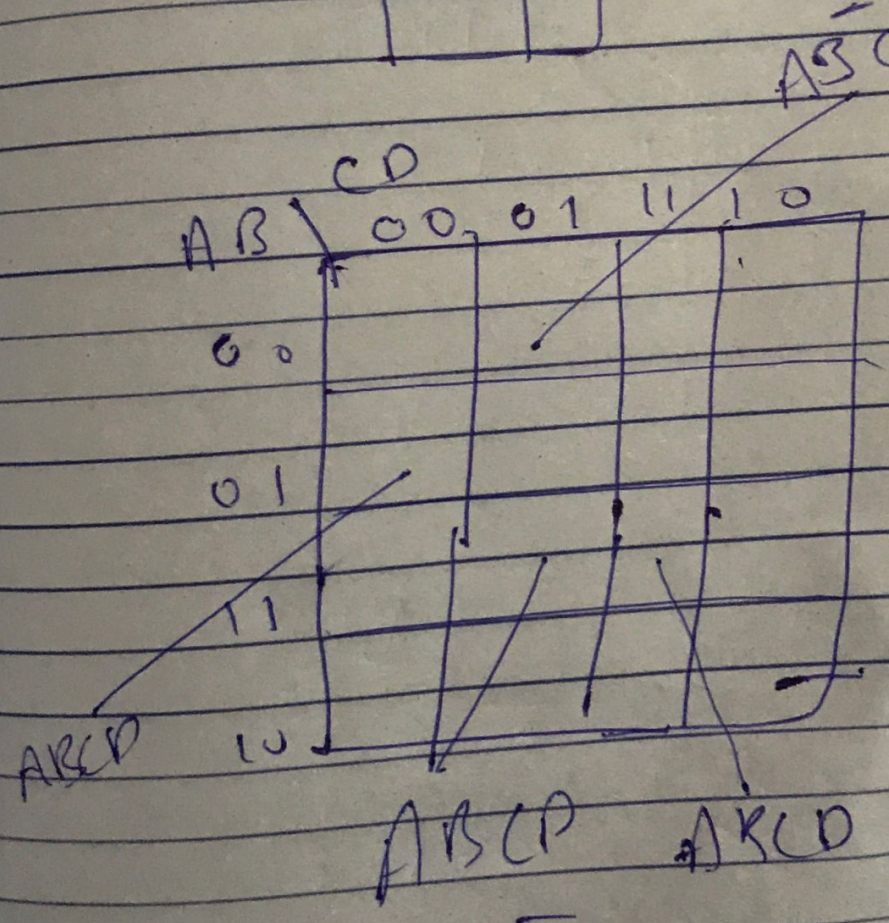
Question No 6





$\bar{A}\bar{B}\bar{C} + A\bar{B}\bar{C} + A\bar{B}C$

000 100 110
001 101
010
011