Computer Organization (Revision)-Assignment-1

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Q-1 Simplify the following expressions using Boolean algebra.

a. A + AB
b. AB + AB'
c. A' BC + AC
d. A'B +ABC' + ABC

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Ans-1 ★ (a) $A + AB$

$\Rightarrow A(1+B)$

$= A.1$

$= A$

So, $A + AB = A$

★ (b) $AB + AB'$

$\Rightarrow A(B+B')$

$= A.1$

$= A$

So, $AB + AB' = A$

★ (c) $A'BC + AC$

$\Rightarrow (A'B+A).C$

$\Rightarrow (A'+A).(B+A).C$ (AND Distributive Law)

$\Rightarrow 1.(B+A).C$

$\Rightarrow (B+A).C$

So, $A'BC + AC = BC + AC$

★ (d) $A'B + ABC' + ABC$

$\Rightarrow A'B + A.B(C'+C)$

$\Rightarrow A'B + A.B.1$

$\Rightarrow (A'+A).B$

$= 1.B = B$

So, $A'B + ABC' + ABC = B$

Q-2 Given the Boolean function F = xy'z + x'y'z + xyz

a. List the truth table of the function.

b. Draw the logic diagram using the original Boolean expression.

c. Simplify the algebraic expression using Boolean algebra.

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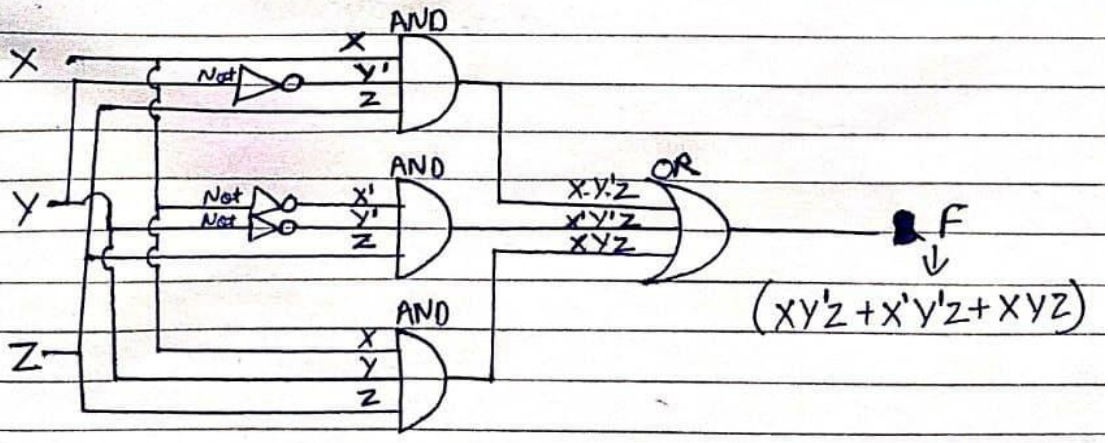
Q-2

Ans-2 Given :- $F = XY'Z + X'Y'Z + XYZ$

(a) Truth table

	X	Y	Z	X'	Y'	Z'	XY'Z	X'Y'Z	XYZ	F=XY'Z+X'Y'Z+XYZ
1	0	0	0	1	1	1	0	0	0	0
2	0	0	1	1	1	0	0	1	0	1
3	0	1	0	1	0	1	0	0	0	0
4	0	1	1	1	0	0	0	0	0	0
5	1	0	0	0	1	1	0	0	0	0
6	1	0	1	0	1	0	1	0	0	1
7	1	1	0	0	0	1	0	0	0	0
8	1	1	1	0	0	0	0	0	1	1

(b) Logic Diagram



Simplification

$$F = XY'Z + X'Y'Z + XYZ$$

$$= (X+X')(Y'Z) + XYZ$$

$$= Y'Z + XYZ$$

$$= (Y'+XY)Z$$

$$= (Y'+X)(Y'+Y)Z$$

$$= (Y'+X)Z$$

$$= Y'Z + XZ$$

Q-3 Simplify the following Boolean functions using three-variable maps.

a. F(x,y,z) = (0, 1,5, 7)

b. F(x.y.z) = (1,2,3,6,7)

c. F(x, y.z) = (3, 5, 6, 7)

d. F(A,B,C) = (0,2,3,4,6)

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Ans-3 (a) $f(x,y,z) = (0,1,5,7)$

$= x'y'z' + x'y'z + xy'z + xyz$

x \ yz	y'z'	y'z	yz	yz'
x'	1 (I)	1	0	0
x	0	1 (II)	1	0

from (I) → $x'y'$

from (II) → xz

So, $(x'y' + xz)$ Ans

(b) $f(x,y,z) = (1,2,3,6,7)$

$= x'y'z + x'yz' + x'yz + xyz' + xyz$

x \ yz	y'z'	y'z	yz (I)	yz'
x'	0	1	1	1 (II)
x	0	0	1	1

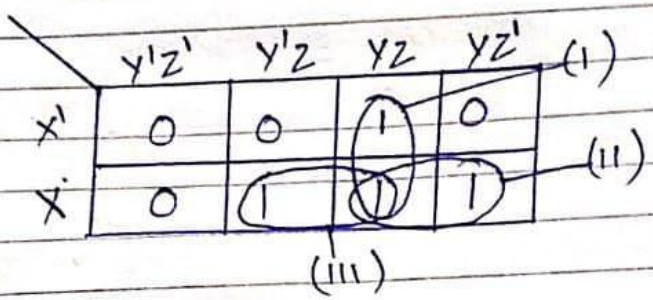
from (I) $x'z$

from (II) y

So, $(x'z + y)$ Ans

(c) $f(x,y,z) = (3,5,6,7)$

$= x'yz + xy'z + xyz' + xyz$



from - (I) → yz

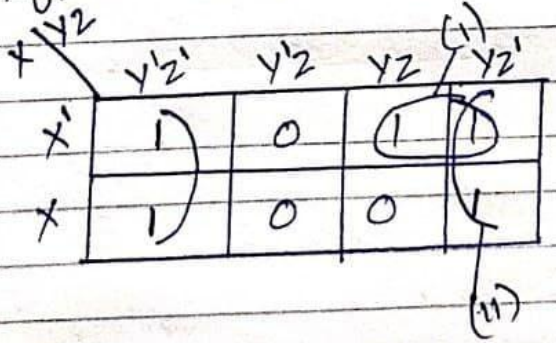
from - (II) → xy

from - (III) → xz

So, $(yz + xy + xz)$ ≡

(d) $f(A,B,C) = (0,2,3,4,6)$

$f(x,y,z) = x'y'z' + x'yz' + x'yz + xy'z' + xyz'$



from - (I) → $x'y$

from - (II) → z'

So, $(x'y + z')$

↓

$(A'B + C')$ ≡

Q-4 Decode the following ASCII code:

1001010 1001111 1001000 1001110 0100000 1000100 1001111 1000101

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Ans-4

1001010 1001111 1001000 1001110 0100000
1000100 1001111 1000101

$x^6\ x^5\ x^4\ x^3\ x^2\ x^1\ x^0$ Decimal equivalu Ascii Char at Decimal Position

$(1001010)_2 \rightarrow 64+8+2 = (74)_{10} \rightarrow$ J

$(1001111)_2 \rightarrow 64+8+4+2+1 = (79)_{10} \rightarrow$ O

$(1001000)_2 \rightarrow 64+8 = (72)_{10} \rightarrow$ H

$(1001110)_2 \rightarrow 64+8+4+2 = (78)_{10} \rightarrow$ N

$(0100000)_2 \rightarrow 32 = (32)_{10} \rightarrow$ ( ) → space

$(1000100)_2 \rightarrow 64+4 = (68)_{10} \rightarrow$ D

$(1001111)_2 \rightarrow 64+8+4+2+1 = (79)_{10} \rightarrow$ O

$(1000101)_2 \rightarrow 64+4+1 = (69)_{10} \rightarrow$ E

So, Code is JOHN DOE

Q-5 Convert the following binary numbers to decimal:

a. **101110**
b. **1110101**
c. **110110100**

Ans-5 (1) $(101110)_2 \rightarrow 1\times2^5+0\times2^4+1\times2^3+1\times2^2+1\times2^1+0\times2^0$

$= 32+0+8+4+2+0$

$= (46)_{10}$

(2) $(1110101)_2 \rightarrow 1\times2^6+1\times2^5+1\times2^4+0\times2^3+1\times2^2+0\times2^1+1\times2^0$

$\Rightarrow 64+32+16+0+4+0+1$

$\Rightarrow (117)_{10}$

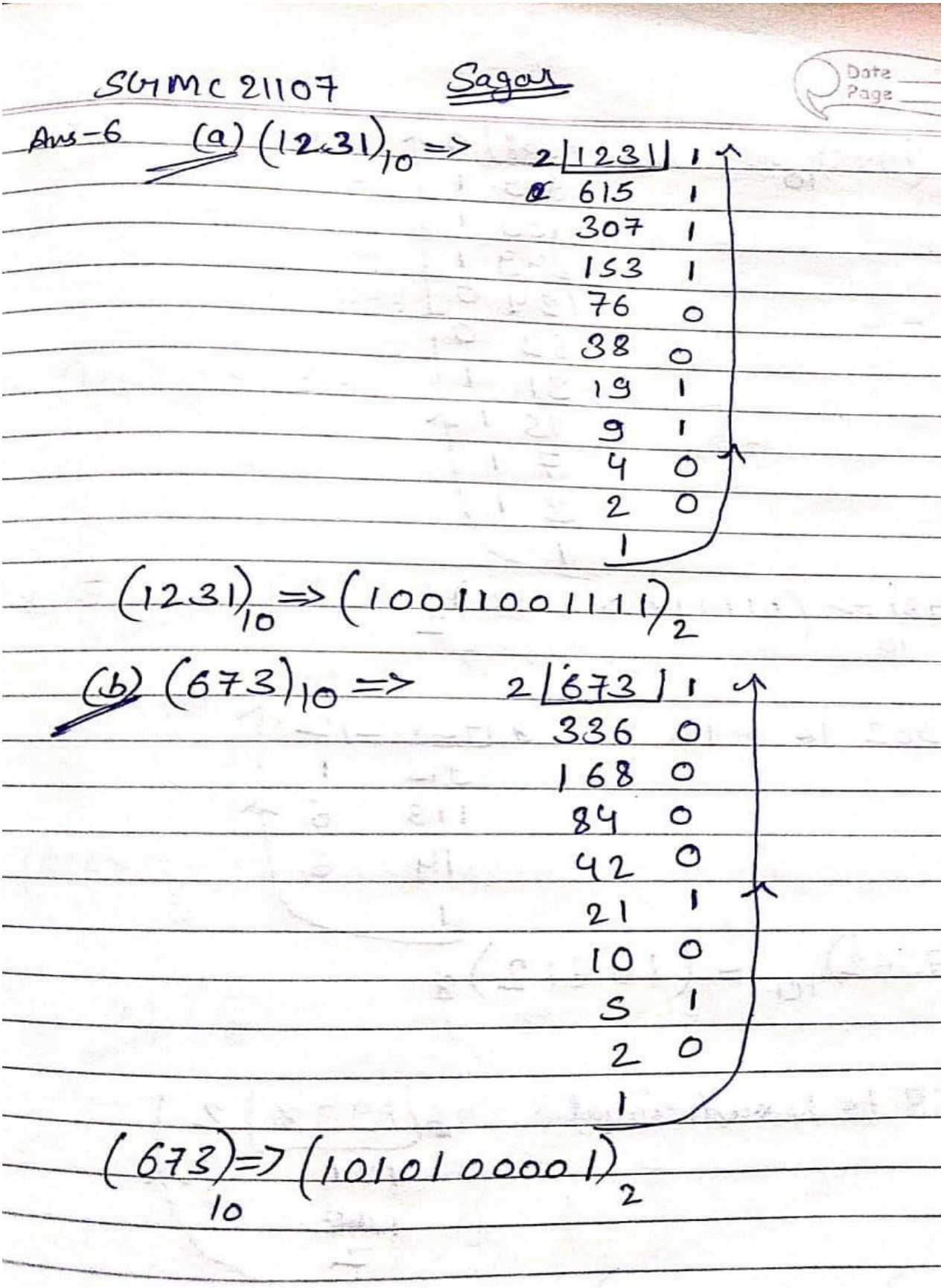
(3) $(110110100)_2 \rightarrow 1\times2^8+1\times2^7+0\times2^6+1\times2^5+1\times2^4+0\times2^3+1\times2^2+0\times2^1+0\times2^0$

$\Rightarrow 256+128+0+32+16+0+4+0+0$

$\Rightarrow (436)_{10}$

Q-6 Convert the following decimal numbers to binary:

a. 1231
b. 673
c. 1998



(c) $(1998)_{10} \Rightarrow$

2 | 1998	0
999	1
499	1
249	1
124	0
62	0
31	1
15	1
7	1
3	1
1	

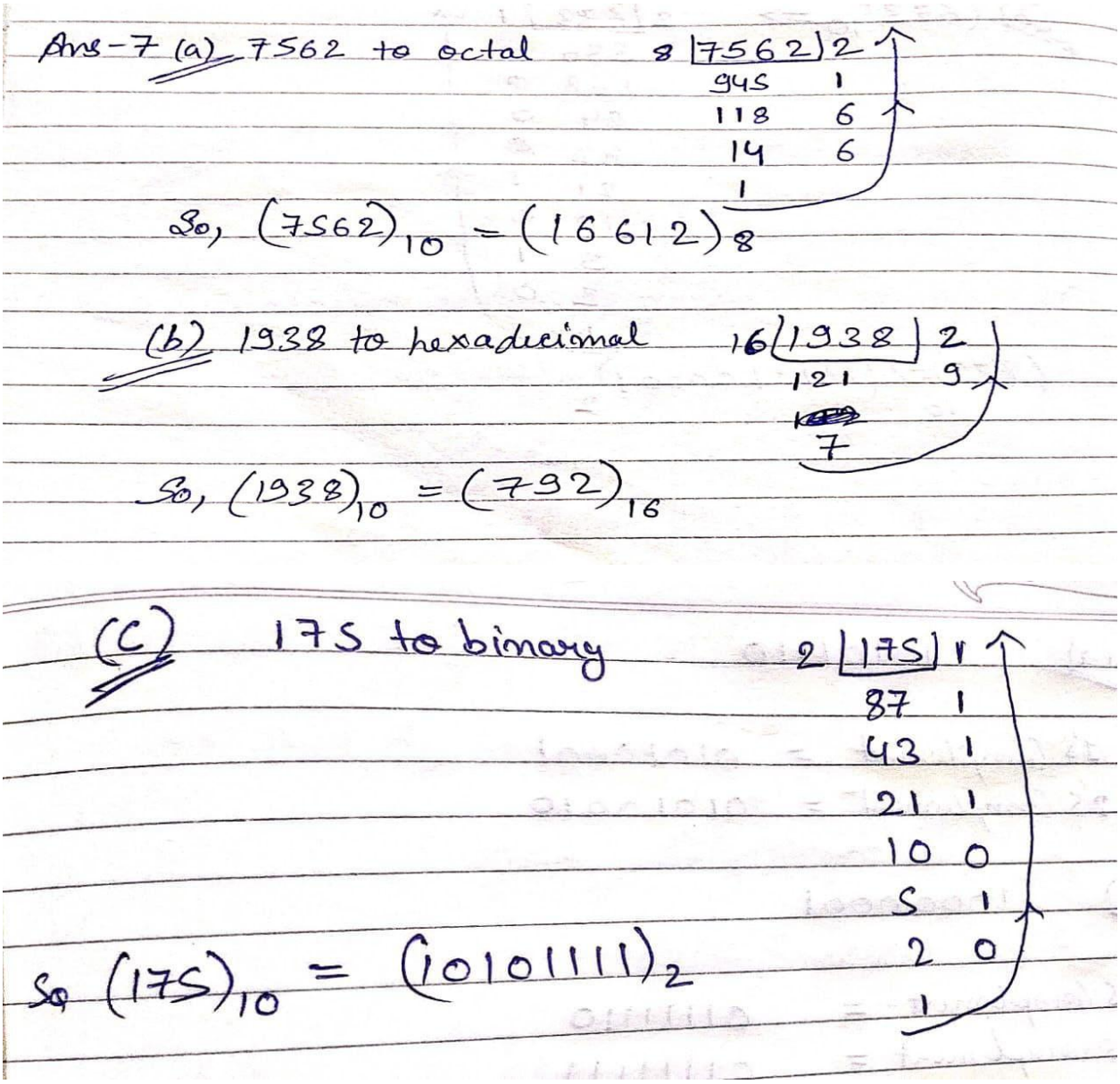
$(1998)_{10} \Rightarrow (11111001110)_2$

Q-7 Convert the following decimal numbers to the bases indicated.

a. 7562 to octal

b. 1938 to hexadecimal

c. 175 to binary



Q-8 Convert the hexadecimal number F3A7C2 to

a. Binary

b. Octal

Ans-8 (a) $(F3A7C2)_{16}$ to binary

15 3 10 7 12 2

1111 0011 1010 0111 1100 0010

So, $(F3A7C2)_{16} = (1111\,0011\,1010\,0111\,1100\,0010)_2$

(b) $(F3A7C2)_{16}$ to Octal

F 3 A 7 C 2

15 3 10 7 12 2

1111 0011 1010 0111 1100 0010

111 100 111 010 011 111 000 010

7 4 7 2 3 7 0 2

So, $(F3A7C2)_{16} = (74723702)_8$