EC 205. Digital Electronics

IInd Test 17/1/18

Q.1 Reduce the following Boolean expressions.

(a) $A + \bar{A}B + AB$

(b) $A\bar{B} + \bar{A}B + AB + \bar{A}\bar{B}$

Ans.

(a)

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

$A + B(\bar{A} + A)$

$A + B \cdot 1 \quad | \because \bar{A} + A = 1$

$A + B$

(b) $A\bar{B} + \bar{A}B + AB + \bar{A}\bar{B}$

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

$A(\bar{B} + B) + (B + \bar{B})\bar{A}$

$(A + \bar{A})(B + \bar{B})$

$1 \cdot 1$

$\Rightarrow 1.$

$\because \bar{A} + A = 1$

$\bar{B} + B = 1$

Q2 Explain all logic gates.

Ans. Symbols of logic gates

(i) $Y = A \cdot B$ AND gate

(ii) OR gate

(iii) NOT gate

Truth table

AND gate

A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

OR gate

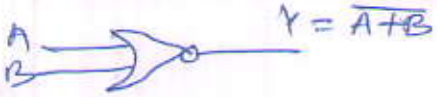
A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1

NOT gate

A	Y
A	$\bar{A}$
$\bar{A}$	A

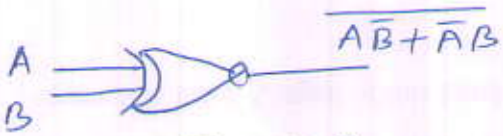
NAND gate

A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0



NOR gate

A	B	Y
0	0	1
0	1	0
1	0	0
1	1	0



Ex-NOR

A	B	Y
0	0	1
0	1	0
1	0	0
1	1	1

Ex-OR

A	B	Y
0	0	0
0	1	1
1	0	1
1	1	0

Q3 Explain DeMorgan's theorem.

Ans :- (i) DeMorgan's 1st theorem

$$\overline{A+B} = \bar{A} \cdot \bar{B}$$

NOR gate = Bubbled AND gate
input

(ii) DeMorgan's 2nd theorem

$$\overline{A \cdot B} = \bar{A} + \bar{B}$$

NAND gate = Bubbled OR gate
input

Q.4 Solve the function using k-map?

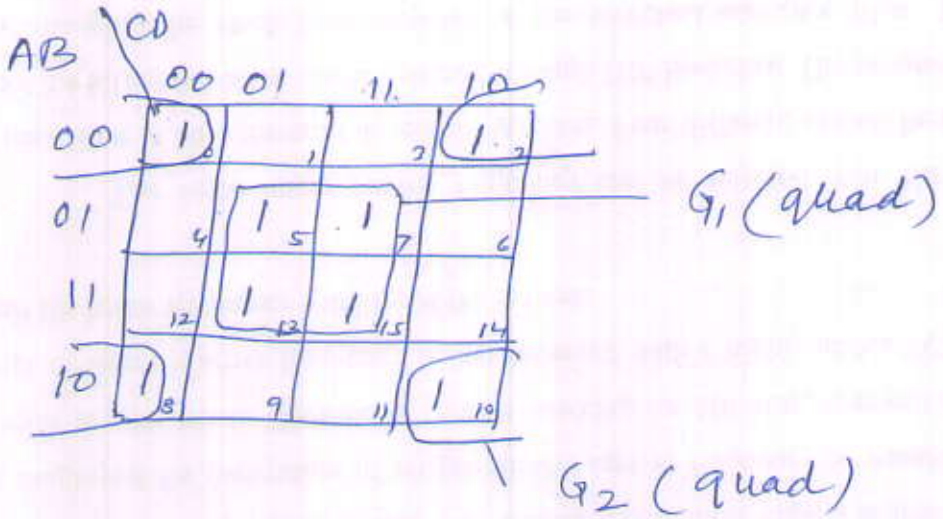
$\Sigma m(0,2,5,7,8,10,13,15)$

Ans.

$$Y = \Sigma m(0,2,5,7,8,10,13,15)$$

Step I This is 4 variables Boolean function. So we ~~have~~ draw the 4 variable K-map.

Step II Draw 4 variable kmap and fill it with given minterms



$$Y = G_1 + G_2$$

$$= B\bar{D} + \bar{B}\bar{D}$$

Q.5 Write down standard SOP form for

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

Ans.

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

$$Y = \bar{A}B(C+\bar{C}) + \bar{A}\bar{B}C + \bar{A}C(B+\bar{B})$$

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