Assignment 02

Abdullah Al Mazid Zomader

ID: 24241189

BRAC University

CSE260: Digital Logic Design

Mr. Mohammed Ashfaqul Haque

March 11, 2025

Ans to the ques no-01

(a) $xyz' + x'yz + xyz + x'yz'$

$= x'yz + x'yz' + xyz' + xyz$

$= x'y(z + z') + xy(z + z')$

$= x'y + xy$

$= y(x + x')$

$= y$ (Ans)

(b) $(x + y' + z')(x' + z')$

$= x \cdot x' + y'x' + z'x' + xz' + y'z' + z'z'$

$= xz' + y'x' + y'z' + [x'z' + z']$

$= xz' + x'y' + [y'z' + z']$

$= x'y' + [xz' + z']$

$= x'y' + z'$ (Ans)

Ans to the ques no-02

(a) $(a'b+cd)\cdot e'+e$

Let,

$F_1 = (a'b+cd)e'+e = a'be'+cde'+e$

Taking Dual,

$F_1' = (a'+b+e')\cdot(c+d+e')\cdot(e)$

After complement:

$F_1' = (a+b'+e)\cdot(c'+d'+e)\cdot(e')$ (Ans)

(b) $(x'+y+z')(x+y')(x+e)$

Let,

$F_1 = (x'+y+z')(x+y')(x+e)$

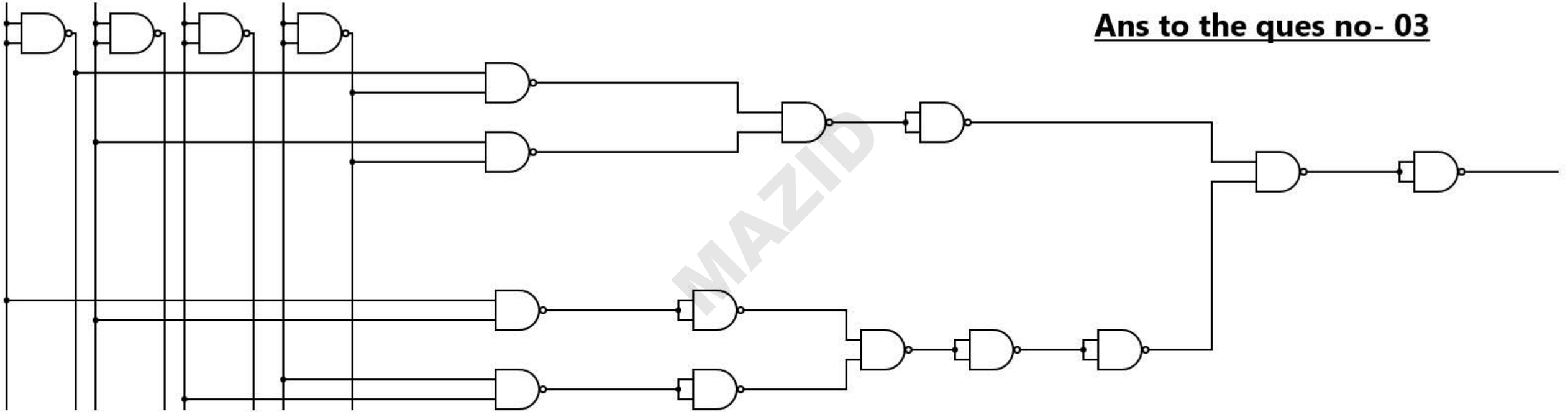
Taking Dual,

$(x'\cdot y\cdot z')+(x\cdot y')+(x\cdot e)$

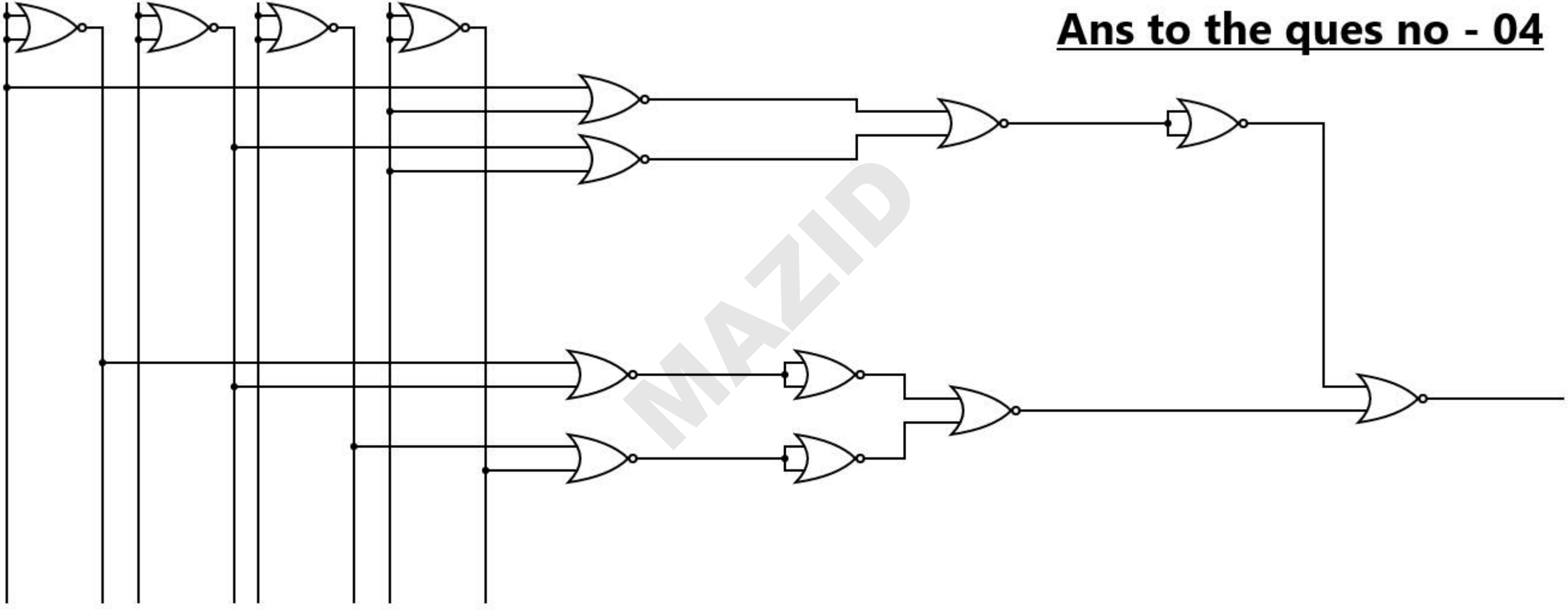
After Complement,

$F_1' = (x\cdot y\cdot z)+(x'\cdot y)+(x'\cdot e')$ (Ans)

Ans to the ques no- 03



Ans to the ques no - 04



Ans to the ques no-05

$F(a,b,c,d) = \Sigma\ (2,5,7,10,11,13)$

$= \Sigma\ (0010, 0101, 0111, 1010, 1011, 1101)$

$= \bar{a}\bar{b}c\bar{d} + \bar{a}\bar{b}cd + \bar{a}bcd + a\bar{b}c\bar{d} + a\bar{b}cd + ab\bar{c}d$

$= \bar{a}(\bar{b}c\bar{d} + \bar{b}cd + bcd) + a(\bar{b}c\bar{d} + \bar{b}cd + b\bar{c}d)$

$= \bar{a}(\bar{b}c\bar{d} + bd(c+\bar{c})) + a(\bar{b}c(d+\bar{d}) + b\bar{c}d)$

$= \bar{a}(\bar{b}c\bar{d} + bd) + a(\bar{b}c + b\bar{c}d)$

⊞ circuit diagram attached

Ans to the ques no-06

$F(x,y,z) = \Sigma\ (2,3,5,6,7)$

$\Rightarrow F(x,y,z) = \Sigma\ (010, 011, 101, 110, 111)$

$= \bar{x}y\bar{z} + \bar{x}yz + x\bar{y}z + xy\bar{z} + xyz$

$= \bar{x}y(z+\bar{z}) + xy(z+\bar{z}) + x\bar{y}z$

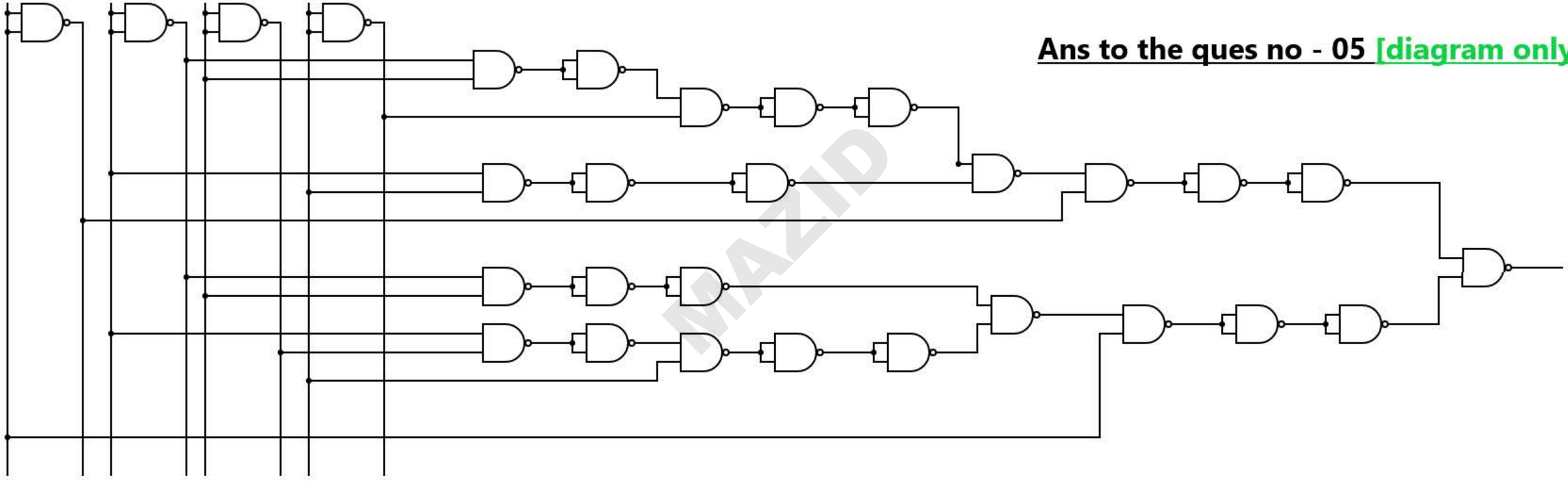
$= \bar{x}y + xy + x\bar{y}z$

$= (\bar{x}+x)y + x\bar{y}z \quad = y + x\bar{y}z$

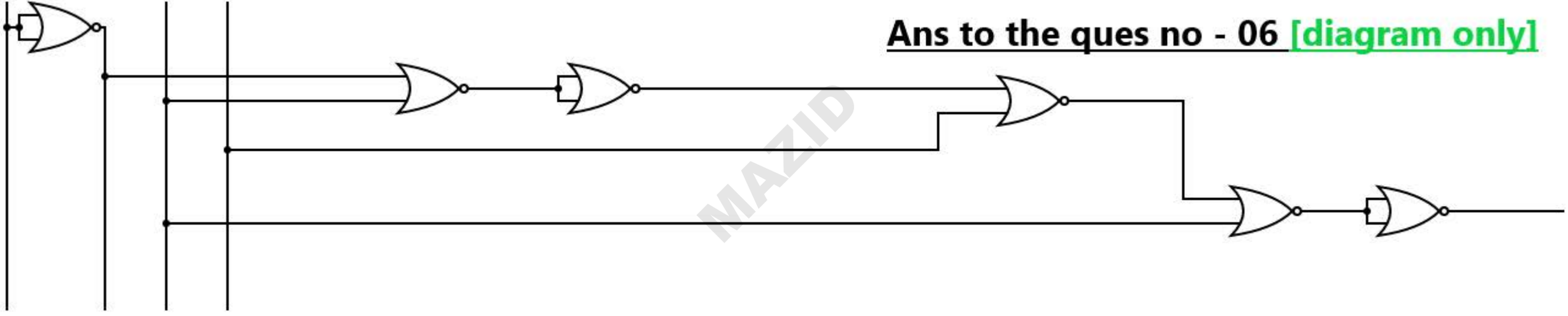
⊞ circuit diagram attached

4
4

Ans to the ques no - 05 [diagram only]



Ans to the ques no - 06 [diagram only]



Ans to the ques no-07 [SOP]

(a) $F(A,B,C,D) = AB + A'+D$

$= AB(C+C')(D+D') + A'(B+B')(C+C')(D+D') + D(A+A')(B+B')(C+C')$

$= ABCD + ABCD' + ABC'D + ABC'D' + A'BCD + A'BC'D + A'B'C'D + A'B'C'D + A'BCD' + A'BC'D' + A'B'CD' + A'B'C'D' + ABCD + AB'CD + A'BCD + A'B'CD + ABC'D + AB'C'D + A'BC'D + A'B'C'D$

$= ABCD + ABCD' + ABC'D + ABC'D' + A'BCD + A'BC'D + A'B'CD + A'B'C'D + A'BCD' + A'BC'D' + A'B'CD' + A'B'C'D' + AB'CD + AB'C'D$

$= 1111 + 1110 + 1101 + 1100 + 0111 + 0101 + 0011 + 0001 + 0110 + 0100 + 0010 + 0000 + 1011 + 1001$

$= 15 + 14 + 13 + 12 + 7 + 5 + 3 + 1 + 6 + 4 + 2 + 0 + 11 + 9$

$= \Sigma(0,1,2,3,4,5,6,7,9,11,12,13,14,15)$ (Ans)

(b)

$F(w,x,y,z) = wx'y + w'y'$

$= wx'y(z+z') + w'y'(x+x')(z+z')$

$= wx'yz + wx'yz' + w'y'xz + w'y'x'z + w'y'xz' + w'y'x'z'$

$= wx'yz + wx'yz' + w'xy'z + w'x'y'z + w'xy'z' + w'x'y'z'$

$= 1011 + 1010 + 0101 + 0001 + 0100 + 0000$

$= 11 + 10 + 5 + 1 + 4 + 0$

$= \Sigma(0, 1, 4, 5, 10, 11)$ (Ans)

Ans to the ques no-07 [POS]

(a)

$F(A,B,C,D) = AB + A' + D$

$= (A' + D + A)(A' + D + B)$

$= (A + A' + D + C \cdot C')(A' + B + D + C \cdot C')$

$= (1 + D + C \cdot C')(A' + B + D + C \cdot C')$

$= 1(A' + B + D + C \cdot C')$

$= (A' + B + D + C)(A' + B + D + C')$

$= (A' + B + C + D)(A' + B + C' + D)$

$= 1000, 1010 = \pi(8, 10)$ (Ans)

(6)

$F(w,x,y,z) = wx'y + w'y'$

$= (wx'y + w')(wx'y + y')$

$= (wx'y + w' + z\cdot z')(wx'y + y' + zz')$

$= (wx'y + w' + z)(wx'y + w' + z')(wx'y + y' + z)(wx'y + y' + z')$

$= (w' + z + wx')(w' + z + y)(w' + z' + wx')(w' + z' + y)$

$(y' + z + wx')(y' + z + y)(wx' + y' + z')(y' + z' + y)$

$= (w' + z + wx' + yy')(w' + z + y + x\cdot x')(w' + z' + wx' + y\cdot y')$

$(w' + z' + y + x\cdot x')(y' + z + wx')(wx' + y' + z')$

$= (w' + z + wx' + y)(w' + z + wx' + y')(w' + z + y + x)(w' + z + y + x')$

$(w' + z' + wx' + y)(w' + z' + wx' + y')(w' + z' + y + x)(w' + z' + y + x')$

$(y' + z + w)(y' + z + x')(w + y' + z')(x' + z' + y')$

$= (w' + z + w + y)(w' + z + x' + y)(w' + z + w + y')(w' + z + x' + y')$

$(w' + z + y + x)(w' + z + y + x')(w' + z' + w + y)(w' + z' + x' + y)$

$(w' + z' + w + y')(w' + z' + x' + y')(w' + z' + y + x)(w' + z' + y + x')$

$(y' + z + w + x\cdot x')(y' + z + x' + w\cdot w')(w + y' + z' + x\cdot x')$

$(x' + y' + z' + w\cdot w')$

$= (w'+x'+y+z)(w'+x'+y'+z)(w'+x+y+z)(w'+x'+y+z)$

$(w'+x'+y+z')(w'+x'+y'+z')(w'+x+y+z')(w'+x'+y+z')$

$(w+x+y'+z)(w+x'+y'+z)(w+x'+y'+z)(w'+x'+y'+z)$

$(w+x+y'+z')(w+x'+y'+z')(w+x'+y'+z')(w'+x+y'+z')$

$= (w'+x+y+z)(w'+x+y+z')(w+x+y'+z)(w+x+y'+z')$

$(w'+x'+y'+z')(w'+x'+y+z)(w'+x'+y+z')(w'+x'+y'+z)$

$(w+x'+y'+z)(w+x'+y'+z')$

$= 1000, 1001, 0010, 0011, 1111, 1100, 1101,$

$1110, 0110, 0111$

$= \pi(8, 9, 2, 3, 15, 12, 13, 14, 6, 7)$

$= \pi(2, 3, 6, 7, 8, 9, 12, 13, 14, 15)$ Ans