



Unit 1.

## COMBINATIONAL Logic.

1. a (i) -11 or 9 No Negative Radix

~~(ii) 1007500-9~~

(iii) 109.01

(iv) -1674.0365 or 76104.7412

(v) 800-8.5

(vi) 13640

(vii)  $x=8$ 

(viii) 16

(ix) 13.3900-13.39

(x) 16

(xi) 8676

(xii) binary 0001 1010 0101 0011

octal 15123

decimal 6739

(xiii) 1E3.

b. 6, 8 or 9, 12.

c.  $Z = (19)_{10}$  or  $(34)_{16}$ 

d. 263. I cannot able to get answers

e.  $x=9$ .

f. 3, 5

Q. a) 1's comp = 101100

2's comp = 101101

b. 11010011

c  $\bigcirc$  —  $da) \Rightarrow y_0 = I_0 + 1, y_2 = \overline{I_2}$   
 $y_1 = \overline{I_1}, y_3 = I_4$

d 267                      b) 0110.

e 0000011              0000011

f 000111

g  $\alpha_3 \alpha_3 \alpha_3 \alpha_3 \alpha_1 \alpha_0$

h  $-128$ .



1. Find the Value of  $X$ ,  $(135) \times \sqrt{44} - (244) \times 2$

We can write  $(135)_x = 1 \times x^2 + 3 \times x + 5 \times x^0$

$$= 1x^2 + 3x + 5 + 18^2 + 4 \times 8 + 6 \times 8^0 = 2x^2 + x + 6$$

$$x^2 + 3x + 5 + 64 + 32 + 6 = 2x^2 + x + 6$$

$$x^2 + 3x + 105 = 2x^2 + x + 6$$

$$3x - x + 105 - 6 = 2x^2 - x^2$$

$$2x + 99 = x^2$$

Quadratic eqn:  $x^2 - 2x - 99 = 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \quad (-9, 11)$$

$(x) \quad 1(x) \quad 1$

$$= \frac{-2 \pm \sqrt{2^2 - 4(1)(-99)}}{2} = \frac{-2 \pm \sqrt{4 + 396}}{2}$$

$$18 \times -99$$

$$= \frac{-2 \pm \sqrt{400}}{2}$$

$$\begin{array}{r} \wedge \quad \wedge \\ 3 \times 6 \quad 9 \times 11 \\ \hline 18 \times 99 \\ \hline 33 \end{array}$$

$$= \frac{-2 + \sqrt{400}}{2} = \frac{-2 + 20}{2}$$

$$= \frac{-2 + 20}{2} = \frac{18}{2}$$

$$= \frac{18}{2} = 9$$

$$= -108 + 9$$

$$\begin{array}{r} x + \\ -99 - 2 \\ \hline \sqrt{-119} \end{array}$$



$$(1135)_x + 64_{10} = (014)_x + 2_{10}$$

$$x^2 + 3x + 5 + 64 = x^2 + x + 4 + 2$$

$$3x - 2 = 69 - 6 = 63$$

$$x^2 + 63 = x^2$$

$$x^2 - x - 63 = 0$$

$$-7 \pm 9$$

$$(9, -7)$$

$$= \frac{2 \pm \sqrt{4 - 264}}{2} = \frac{2 \pm \sqrt{-260}}{2}$$

$$x = 705 - 2 \quad (9, -7)$$

$$(3) (470.56)_{16} - (097.55)_{16} \rightarrow \text{Error}$$

$$470.56$$

$$097.55$$

$$1000000$$

$$1000000$$

$$5D$$

$$14$$

$$49$$

$$5EF.1D$$

$$AC.04$$

$$543.19$$

$$(4) (071.05)_8 - (475.235)_{16}$$

$$0100 \ 0111 \ 0101.0010 \ 0011 \ 0101$$

$$2165.1065$$

$$071.0500$$

$$2165$$

$$1674.0365$$

$$77777777$$

$$02165.1065$$

$$5613.6712$$

$$271.0500$$

$$76104.7412$$

$$(1) 1674.0365$$

4.  $(136)_{10} = (210)_x$

$$136 = 2x^2 + x + 0$$

$$2x^2 + x - 136 = 0$$

$$x = 8 \text{ (or } -8.9)$$

~~136~~  $\phi$

$$-68 + 5$$

$$-808.5$$

5.  $(182)_{16} = (?)_{10}$

$$(8 \times 16) + 8 = 136$$

$$-8 - \frac{1}{10x^2}$$

(vi)  $(155/443)_8 = (3)_{10}$

$$-9 - \frac{1}{10x^2}$$

$$-1/4$$

$$\frac{x^3 + 5x^2 + 5x + 1}{4x^2 + 4x + 3} = 3$$

$$x^3$$

$$x^3 + 5x^2 + 5x + 1 = 12x^2 + 12x + 9$$

$$x^3 - 7x^2 - 7x - 8 = 0$$

$$\boxed{x=8}$$

$$8=8$$





$$x = \frac{39.4776}{10} \text{ or } x = \frac{39.4776}{10}$$

$$x = \frac{8.75}{10} \text{ or } x = \frac{8.75}{10}$$

$$x = .0875 \text{ or } x = 8.676$$

(X1)  $(1A53)_{16} = ?$

Binary  $= 0001\ 1010\ 0101\ 0011$   
 in octal  $= 1.512.3$

in decimal -  
 $= 16^3 + (10 \times 16^2) + (5 \times 16) + 3$   
 $= 4096 + 2560 + 80 + 3$   
 $= 6739$

Q.  $(84)_x = (64)_y \Rightarrow (84)_6 = (64)_8$   
 $8x + 4 = 6y + 4 \Rightarrow (84)_9 = (64)_{12}$

$$8x = 6y$$

$$x = \frac{6y}{8} = \frac{3y}{4}$$

$$x = \frac{3y}{4} \quad y = \frac{4x}{3}$$

$$y = 16$$

$$x = 12$$

$$x = 6 \quad 4 \times 6^2 = 8$$

$$x = 9 \quad 4 \times 9^2 = 12$$



c.  $(x)_7 + y(8)(w)(10) + z(15) = k(19)$

$$(36)_7 + (67)_8 + (98)_{10} + z(15) = (241)_9$$

$$(3 \times 7) + 6 + (6 \times 8) + 7 + 98 + 5z = (2 \times 81) + (4 \times 9) + 1$$

$$21 + 6 + 48 + 7 + 98 + 5z = 162 + 36 + 1$$

$$180 + 5z = 199$$

$$5z = 19$$

$$z = (34)_5$$

$$\begin{array}{r} 5 \overline{) 19} \\ 3 \end{array}$$

d.  $(21A)_x$

$$= 2x^2 + x + 10 = 0$$

$$= 2x^2 + x + 10 = 0$$

$$\begin{array}{cc} P & S \\ 20 & 1 \\ \swarrow & \searrow \\ & 5 \end{array}$$

E. the  $66/5 = 13$ .

$$6x + 6 + 5 = x + 13$$

$$6x + 11 + x - 3 = 0$$

$$5x + 9 = 0$$

$$x = \frac{-9}{5}$$

$$6x + 6 = (x + 3)5$$

$$6x + 6 = 5x + 15$$

$$\boxed{x = 9}$$



F.  $(11A1B)_8 = 18CD$

$$\begin{array}{ccccccc} & 1 & & 1 & & A & & 1 & & B \\ \hline & 001 & 001 & 011 & 001 & 001 & 01 \\ \hline \downarrow & & \downarrow & & \downarrow & & \\ & 1 & & 2 & & C=12 & & D=13_{10} \end{array}$$

$1100 = A \Rightarrow$

~~0010011001101~~

~~A=7 B=3 B=5~~

~~A=3 B=5~~

Q Complement

a)  $19 \Rightarrow 010011$   
1's Comp =  $101100$   
2's Comp =  $101101$

$$\begin{array}{r} 2 \overline{) 19} \\ 2 \overline{) 9} - 1 \\ 2 \overline{) 4} - 1 \\ 2 \overline{) 2} - 0 \\ 1 - 0 \end{array}$$

b)  $45 = 101101$   
 $= 00101101$   
 $= 11010011$

$$\begin{array}{r} 2 \overline{) 45} \\ 2 \overline{) 22} \\ 2 \overline{) 11} - 1 \\ 2 \overline{) 5} - 1 \\ 2 \overline{) 2} - 1 \\ 10 \end{array}$$

c.  $ABCD - ABCD$

$= 0$   
 $= 0'$  is same for Natural,  
 1's comp, & 2's comp

d.

a)

$$y_0 = \Sigma 0' 1$$

$$y_1 = I_1'$$

$$y_2 = I_2'$$

$$y_3 = I_3'$$

b)

$$\begin{array}{r} 1010 \\ 011 \\ \hline 1111 \end{array}$$

$$\begin{array}{r} 1010 \\ 0110 \\ \hline 1010 \end{array}$$

$$\begin{array}{r} 1010 \\ 011 \\ \hline 1101 \end{array}$$

Stage 1

$$\begin{array}{r} 1010 \\ 0101 \\ \hline 1 \\ 0110 \end{array}$$

Stage 2 :-

$$\begin{array}{r} 0110 \\ 1001 \\ \hline 1 \\ 1010 \end{array}$$

Stage 3 :-

$$\begin{array}{r} 1010 \\ 0101 \\ \hline 1 \\ 0110 \end{array}$$

>>>



d) The 10's complement of  $(843)_{10} \rightarrow$

$$\begin{array}{r} 10 \quad 10 \quad 10 \\ 8 \quad 4 \quad 3 \\ \hline (2 \quad 6 \quad 7)_{10} \end{array}$$

E  $P = 11101101 \quad Q = 11100110$

$$\begin{array}{r} P \rightarrow 11101101 \\ - Q \rightarrow 11100110 \\ \hline 00000111 \end{array}$$

6.  $X = 0110 \quad Y = 11001$

$$\begin{array}{r} + X = 0110 \\ + Y = 11001 \\ \hline 100111 \\ \hline = 00111 \end{array}$$

→ Sign bit

= 000111

g. 4-bit signed 2's comp  $\rightarrow a_3 a_2 a_1 a_0$

6-bit  $= a_5 a_4 a_3 a_2 a_1 a_0$

h. 2's comp  $= 10000000$

= -128

$$\begin{array}{r} 0111111 \\ \hline 1 \quad 000 \end{array}$$