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Q1: Convert each of the following number to the required number system.

A.)  $(1011100.10101)_2 = (\dots)_{10}$   
Ans =  $2^6 + 2^5 + 2^4 + 2^3 + 2^2 \cdot 2^{-1} + 2^{-2} + 2^{-3} + 2^{-4} + 2^{-5}$   
 $\Rightarrow 64 + 0 + 16 + 8 + 4 + 0 + 0 + 0 + 0.5 + 0 + 0.125$   
 $+ 0 + 0.3125$   
 $\Rightarrow 92.65625_{10}$  [Ans]

B.)  $111100.101_2 (\dots)_{10}$

Ans: =  $2^5 + 2^4 + 2^3 + 2^2 + 2^1 + 2^0 \cdot 2^{-1} + 2^{-2} + 2^{-3}$   
 $\Rightarrow 32 + 16 + 8 + 4 + 0 + 0 + 0.5 + 0 + 0.125$   
 $\Rightarrow 60.625_{10}$  [Ans]

C.)  $(ABCD)_{16} = (\dots)_2$

$\Rightarrow 1010|0111001101_2$

$\Rightarrow 10 \cdot 16^3 + 11 \cdot 16^2 + 12 + 16 + 13 \cdot 16^0$

$\Rightarrow 40960 + 2816 + 192 + 13$

= 43981

D.)  $(10)_{10} = (\dots)_{16}$

$\frac{10}{16} = 0.625 \times 16 = 10 = (B)_{16}$

(2)

$$\begin{aligned} \text{E). } (7777)_8 &= (\dots)_{10} \\ &\Rightarrow 7 \cdot 8^3 + 7 \cdot 8^2 + 7 \cdot 8^1 + 7 \cdot 8^0 \\ &= 3584 + 448 + 56 + 7 \\ &= (4095)_{10} \end{aligned}$$

$$\begin{aligned} \text{F). } (7777)_8 &= (\dots)_2 \\ &= (0111\ 0111\ 0111\ 0111)_2 \end{aligned}$$

$$\begin{aligned} \text{G). } (7777)_8 &= (\dots)_{16} \\ \frac{7777}{16} &= 486.062 = 0.662 \times 16 = 0 \\ \frac{486}{10} &= 30.375, \quad 0.375 \times 16 = 6 \\ \frac{30}{16} &= 1.875 = 0.875 \times 16 = 14 \\ \frac{1}{16} &= 0.0625 \times 16 = 1 \\ &= (06E1)_{16} \end{aligned}$$

$$\begin{aligned} \text{H). } (10101111)_2 &= (\dots)_8 \\ &\Rightarrow 2^7 + 2^6 + 2^5 + 2^4 + 2^3 + 2^2 + 2^1 + 2^0 \\ &= 128 + 0 + 32 + 8 + 4 + 2 + 1 \end{aligned}$$

$$\begin{aligned} &= 175 \\ \text{Now } \frac{175}{8} &= 21.875 \Rightarrow 0.875 \times 8 = \boxed{7} \end{aligned}$$

$$\begin{aligned} \text{I). } (101010)_{10} &= (\dots)_8 \\ &\Rightarrow 2^5 + 2^4 + 2^3 + 2^2 + 2^1 + 2^0 \\ &= 32 + 0 + 8 + 0 + 2 + 0 = (42)_{10} \end{aligned}$$

$$\begin{aligned} &\Rightarrow \text{Now} \\ \frac{42}{8} &= 5.25 = 0.25 \times 8 = 2 \end{aligned}$$

$$\begin{aligned} \frac{5}{2} &= 0.625 \times 8 = 5 \\ &\Rightarrow (25)_8 \end{aligned}$$

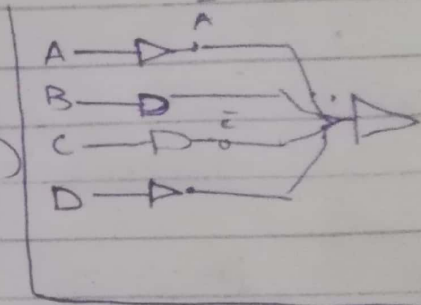
j).  $(98)_{10} = (\dots)_{BCD}$

Q2: Apply De-Morgan's theorems to each expressions

A).  $\overline{A\bar{B}(C+D)}$

Solution

$$= \overline{A\bar{B}} + \overline{(C+D)}$$
$$= \overline{A} + \overline{\bar{B}} + \overline{C} \cdot \overline{D}$$
$$= \overline{A} + B + \overline{C} \cdot \overline{D}$$



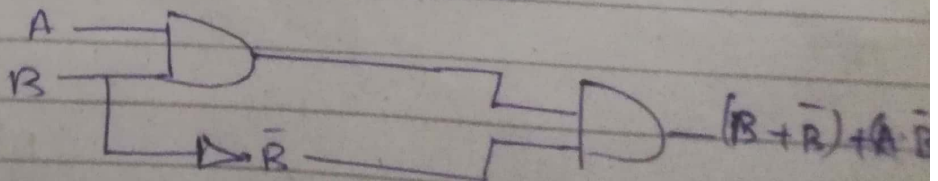
Answer

B).  $\overline{A+B+C+D} + \overline{ABCD}$

Solution

$$\overline{A+B+C+D} + \overline{ABCD}$$
$$= \overline{A} \cdot \overline{B} \cdot \overline{C} \cdot \overline{D} + \overline{A+B+C+D}$$

Answer





(4)

Q3. A)  $\bar{x}\bar{y}\bar{z} + \bar{x}y\bar{z} + x\bar{y}z + x\bar{y}\bar{z}$   
truth table

x	y	z	x
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	0

B)  $\bar{A}\bar{B}\bar{C}\bar{D} + A\bar{B}\bar{C}\bar{D} + \bar{A}\bar{B}CD + \bar{A}\bar{B}\bar{C}D$   
truth table

A	B	C	D	x
0	0	0	0	1
0	0	0	1	0
0	0	1	0	1
0	0	1	1	1
0	1	0	0	0
0	1	0	1	0
0	1	1	0	1
0	1	1	1	0

(5)

Q4:- Convert the following expressions to Sum-of-product (SOP) forms.

A)  $BC + DE(B\bar{C} + DE)$

Solution

$$BC + DEB\bar{C} + DEDE$$

$$A \cdot A = A$$

$$BC + DEB\bar{C} + DE$$

(B)  $BC(\bar{C}\bar{D} + CE)$

Solution

$$BC\bar{C}\bar{D} + BCCE$$

$$C \cdot \bar{C} = 0$$

$$0 + BCCE$$

$$C \cdot C = C$$

$$BCE$$

(C)  $B + C[BD + (C + \bar{D})E]$

Solution

$$B + C[BD + EC + E\bar{D}]$$

$$B + CBD + CEC + CE\bar{D}$$

$$C \cdot C = C$$

$$B + CBD + CE + CE\bar{D}$$