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1) How many symbols are used in the decimal number system?

a) 2 b) 8 c) 10 d) 16

Ans → c) 10

2) What does $(10)_{16}$ represent in decimal number system?

a) 10 b) 0A c) 16 d) 15

$$= 1 \times 16^1 + 0 \times 16^0$$

$$= 16$$

Ans → c) 16

3) How many bits have to be grouped together to convert binary number to its corresponding octal number?

a) 2 b) 3 c) 4 d) 5

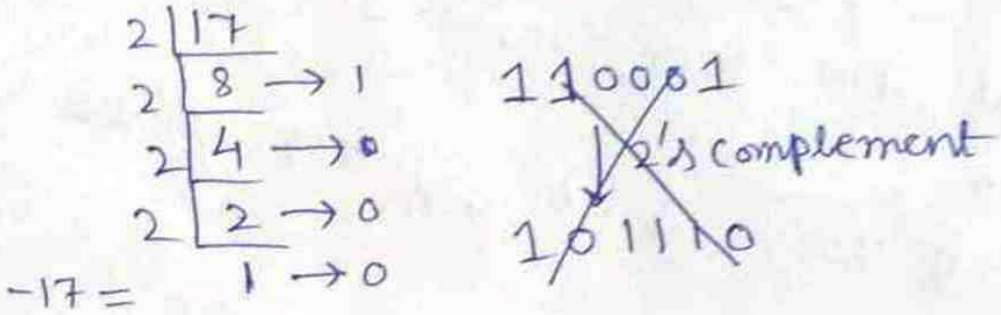
Ans → b) 3

P.T.O

4) The 2's complement representation of -17 is →

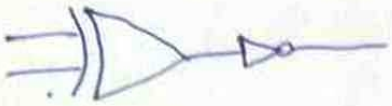
a) 0110 b) 01111 c) 11110

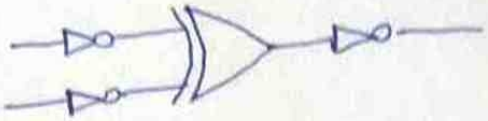
d) 10001

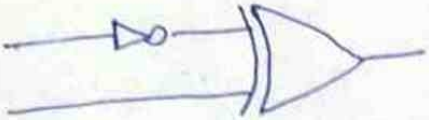


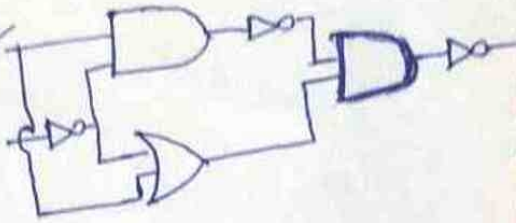
Ans → b) 01111

5) Which one of the following circuits is NOT equivalent to a 2 input X NOR gate ?

a) 

b) 

c) 

d) 

Ans → (d)

6) A function of boolian variables X, Y and Z is expressed in terms of the min-terms of $F(X,Y,Z) = \Sigma m(1,2,5,6,7)$. What the product of sums given below is equal to the function of F(X, Y, Z)

X	Y	Z	Output (M)
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

The product of sum is (POS)

⇓

$(X+Y+Z).(X+\bar{Y}+\bar{Z})$
$(\bar{X}+Y+Z)$

The canonical POS form of $F(x,y,z)$ is

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

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

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

The minimal POS form of $F(x,y,z)$ is

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

7) The minterm expansion of $f(P,Q,R)$ $= PQ + Q\bar{R} + P\bar{R}$ is

a) $m_2 + m_3 + m_6 + m_7$ ✓

b) $m_0 + m_1 + m_3 + m_5$

c) $m_0 + m_1 + m_6 + m_7$

d) $m_0 + m_1 + m_3 + m_5$

e) $m_2 + m_3 + m_4 + m_5$

$f(P,Q,R) = PQ + Q\bar{R} + P\bar{R}$

$= PQ(R+\bar{R}) + Q\bar{R}(P+\bar{P}) + P\bar{R}(Q+\bar{Q})$

$= PQR + PQ\bar{R} + Q\bar{R}P + Q\bar{R}\bar{P} + P\bar{R}Q + P\bar{R}\bar{Q}$

$= PQR + PQ\bar{R} + Q\bar{R}\bar{P} + P\bar{R}\bar{Q}$

So the min term expression of $f(P,Q,R)$ is

$m_7 + m_6 + m_2 + m_3$

12) Represent each of the following values as a 6 bit signed binary number in one's complement and 2's complement forms.

a) 28 b) -21 c) -5 d) -13

a) 28 →

2 | 28
2 | 14 → 0
2 | 7 → 0
2 | 3 → 1
1 → 1

$(28)_{10} = (011100)_2$

1's complement of 28 is
$= (100011)_2$

2's complement of 28 is
$= (100100)_2$

b) -21 →

2 | 21
2 | 10 → 1
2 | 5 → 0
2 | 2 → 1
1 → 0

$(-21)_{10} \rightarrow (110101)_2$

1's complement of -21 is
$= (001010)_2$

2's complement of -21 is
$= (001011)_2$

c) -5 →

2 | 5
2 | 2 → 1
1 → 0

$(-5)_{10} = (000101)_2$

1's complement of -5 is →
$= (111010)_2$

2's complement of -5 is →
$= (111011)_2$

d) -13 →

2 | 13	
2 | 6 → 1	
2 | 3 → 0	
2 | 1 → 1	

$(-13)_{10} \rightarrow (001101)_2$

1's complement of -13 is —
$(110010)_2$

2's complement of -13 is —
$(110011)_2$

11) Convert the following numbers into binary —

a)

a) $(1236)_{10} = (100110100100)_2$

b) $(2349)_{10} = (100100101101)_2$

c) $(345.275)_{10}$

2 | 345	
2 | 172 → 1	
2 | 86 → 0	
2 | 43 → 1	
2 | 21 → 1	
2 | 10 → 0	
2 | 5 → 0	
2 | 2 → 1	
2 | 1 → 0	

.275 × 2	= 0.550	0
.550 × 2	= 1.100	1
.100 × 2	= 0.200	0
.200 × 2	= 0.400	0
.400 × 2	= 0.800	0
.800 × 2	= 1.600	1
.600 × 2	= 1.200	1
.200 × 2	= 0.400	0

$(345.275)_{10} = (101011001.01000110)_2$

d) $(4567)_8$

$\Downarrow$

$(100\,101\,110\,111)_2$

e) $(45.65)_8$

$\Downarrow$

$(100\,101.110\,101)_2$

f) $(145.23)_8$

$\Downarrow$

$(001\,100\,101.010\,011)_2$

g) $(ADF5)_{16}$

$\Downarrow$

$(1010\,1101\,1111\,0101)_2$

h) $(AD.F3)_{16}$

$\Downarrow$

$(1010\,1101.1111\,0011)_2$

i) $(12.DA)_{16}$

$\Downarrow$

$(0001\,0010.1101\,1010)_2$

10) Convert the following octal numbers to binary and hexadecimal numbers?

a) $(7643)_8 = (111\,110\,100\,011)_2 = (FA3)_{16}$

b) $(2643)_8 = (010\,110\,100\,011)_2 = (5A3)_{16}$

c) $(1034)_8 = (001\,000\,011\,100)_2 = (21C)_{16}$

d) $(3245)_8 =$ ~~(001100~~

↳ $(011\,010\,100\,101)_2 = (6A5)_{16}$

e) $(6712)_8 = (110\,111\,000\,010)_2 = (DCA)_{16}$

f) $(7512)_8$ ~~= (111100~~

↳ $(111\,101\,001\,010)_2 = (F4A)_{16}$

9)

a) $(78AD)_{16} = (0111100010101101)_2$
$= (74255)_8$

b) $(DAG43)_{16} = (11011010011001000011)_2$
$= (3323103)_8$

c) $(EDC8)_{16} = (1110110111001000)_2$
$= (166710)_8$

d) $(3245)_{16} = (0011001001000101)_2$
$= (31105)_8$

e) $(6891 2)_{16} = (0110 1000 1001 0001 0010)_2$
$= (1504422)_8$

f) $(AF4D)_{16} = (1010 1111 0100 1101)_2$
$= (127515)_8$

8) a) $(10110111)_2$

$= 1\times2^7 + 0\times2^6 + 1\times2^5 + 1\times2^4 + 0\times2^3 + 1\times2^2 + 1\times2^1 + 1\times2^0$

$= 128 + 132 + 16 + 4 + 2 + 1$

$= (183)_{10}$

b) $(5674)_{10} = (?)_8$

2	5674	
2	2837	0
2	1418	1
2	709	0
2	354	1
2	177	0
2	88	1
2	44	0
2	22	0
2	11	0
2	5	1
2	2	1 ↑
	1	0

$(1011000101010)_2$

c) $(10011100)_2 = (234)_8$

d) $(2453)_8 = (010100101011)_2$

e) $(11100010)_2 = (1D2)_{16}$

g) $(1010101.001)_2 = (?)_{10}$

$(1010101)_2 =$
$= 1\times2^6 + 0\times2^5 + 1\times2^4 + 0\times2^3 + 1\times2^2 + 0\times2^1 + 1\times2^0$

$= 64 + 16 + 4 + 1$

$= (85)_{10}$

$(.001)_2 = 0\times2^{-1} + 0\times2^{-2} + 0\times2^{-3}$

$= (.125)_{10}$

$(1010101.001)_2 = (85.125)_{10}$

h) $(6FAB7)_{16} = (?)_{10}$

$= 6\times16^4 + 15\times16^3 + 10\times16^2 + 11\times16^1 + 7\times16^0$

$= (457399)_{10}$

i) $(11101.101)_2 = (?)_8$

$= (35.5)_8$

j) $(56238)_{16} = (?)_2$

$= (01010110001000111000)_2$

k) $(68934)_{10} = (?)_2$

$(10000000011000110)_2$