Piyush Gambhir 21CSU349 CSE-F (CS-12)

1. $(3A)_{16} = (3 \times 16^1) + (A \times 16^0)$

$= (3 \times 16) + (10 \times 1)$

$= 48 + 10$

$= (58)_{10}$

Therefore, $(3A)_{16} = (58)_{10}$

(5) $(123)_5 = (x8)_y$

Converting $(123)_5$ into base 10.

$$
\begin{aligned}
(123)_5 &= (1 \times 5^2) + (2 \times 5^1) + (3 \times 5^0) \\
&= (1 \times 25) + (2 \times 5) + (3 \times 1) \\
&= (25) + (10) + (3) \\
&= (38)_{10}
\end{aligned}
$$

$\therefore (123)_5 = (38)_{10}$

Converting $(x8)_y$ into base 10

$$
\begin{aligned}
(x8)_y &= (x \times y^1) + (8 \times y^0) \\
&= (xy) + 8 \\
&= (xy + 8)_{10}
\end{aligned}
$$

$\therefore (x8)_y = (xy + 8)_{10}$

Now,

$$(38)_{10} = (xy + 8)_{10}$$

$$38 = xy + 8$$

$$xy = 30$$

From the above equation, we can compute that there are three set of values of x and y that satisfy the above equation.

i.e. (x, y) : $(1, 30), (2, 15), (3, 10)$

Hence, there are three possible solutions of the equation $(123)_5 = (x8)_y$.

6) Range of integers that can be repre-sented by an n-bit 2's complement number system is :

$-(2^{n-1})$ to $+(2^{n-1})$.

7) $(111111110010)_2$ to Hexadecimal

$(111111110010)_2$ to Decimal

$$(111111110010)_2 = (2^{11} \times 1) + (2^{10} \times 1) + (2^9 \times 1) + (2^8 \times 1) + (2^7 \times 1) + (2^6 \times 1) + (2^5 \times 1) + (2^4 \times 1) + (2^3 \times 0) + (2^2 \times 0) + (2^1 \times 1) + (2^1 \times 0)$$

$= 2^{11} + 2^{10} + 2^{9} + 2^{8} +$
$2^{7} + 2^{6} + 2^{5} + 2^{4} + 2^{1}$

$= 2048 + 1024 + 512 +$
$256 + 128 + 64 + 32 +$
$16 + 2$

$= (4082)_{10}$

$(4082)_{10}$ to Hexadecimal

16	4082	Remainder
16	255	2
16	15	15
	0	15

$(4082)_{10} = (BB2)_{16}$

$\therefore (111111110010)_2 = (4082)_{10}$

$= (FF2)_{16}$

(8) $(532.2)_8$ in Decimal

$(532.2)_8 = (5\times8^2) + (3\times8^1) +$

$(2\times8^0) + (2\times8^{-1})$

$= (5\times64) + (3\times8) + (2\times1) + (2/8)$

$= 320 + 24 + 2 + 0.25$

$= (346.25)_{10}$

$\therefore (532.2)_8 = (346.25)_{10}$

(9) $(645)_8$ in Decimal

$(645)_8 = (6\times8^2) + (4\times8^1) + (5\times8^0)$

$= (6\times64) + (4\times8) + (5\times1)$

$= 384 + 32 + 5$

$= (421)_{10}$

$\therefore (645)_8 = (421)_{10}$

(10) Quantity of Double Words is 32-Bits.

(11) $(24)_8$ to Binary

First, We convert $(24)_8$ to Decimal

$$
\begin{aligned}
(24)_8 &= (2\times8^1) + (4\times8^0) \\
&= (2\times8) + (4\times1) \\
&= (16) + (4) \\
&= (20)_{10}
\end{aligned}
$$

$\therefore (24)_8 = (20)_{10}$

Now, Convert $(20)_{10}$ to Binary.

$(20)_{10} = (10100)_2$

2	20	Remainder
2	10	0
2	5	0
2	2	1
	1	0

$\therefore (24)_8 = (20)_{10} = (10100)_2$

(12) $(11\,011\,000\,1010)_2$ to Octal

First, We convert $(110110001010)_2$ to Decimal.

$(110110001010)_2$

$= (1 \times 2^{11}) + (1 \times 2^{10}) + (0 \times 2^{9}) + (1 \times 2^{8}) + (1 \times 2^{7}) + (0 \times 2^{6}) + (0 \times 2^{5}) + (0 \times 2^{4}) + (1 \times 2^{3}) + (0 \times 2^{2}) + (1 \times 2^{1}) + (0 \times 2^{0})$

$= 2^{11} + 2^{10} + 2^{8} + 2^{7} + 2^{3} + 2^{1}$

$= 2048 + 1024 + 256 + 128 + 8 + 2$

$= (3466)_{10}$

Now, We Convert $(3466)_{10}$ to Octal.

$(3466)_{10} = (6612)_8$

8	3466	Remainder
8	433	2
8	54	1
	6	6

$\therefore (11011000101010)_2 = (3466)_{10}$

$= (6612)_8$

(13) $(651.124)_8$ to Decimal

$(651.124)_8 = (6 \times 8^2) + (5 \times 8^1) + (1 \times 8^0) + (1 \times 8^{-1}) + (2 \times 8^{-2}) + (4 \times 8^{-3})$

$= (6 \times 64) + (5 \times 8) + (1 \times 1) + (1/8) + (2/64) + (4/512)$

$= 384 + 40 + 1 + 0.125 + 0.032 + 0.009$

$= (425.166)_{10}$

$\therefore (651.124)_8 = (425.166)_{10}$

(14) $(1E2)_{16}$ to Decimal

$$(1E2)_{16} = (1 \times 16^2) + (E \times 16^1) + (2 \times 16^0)$$

$$= (16^2) + 16(14) + 2(1)$$

$$= 256 + 80 + 2$$

$$= (338)_{10}$$

$\therefore (1E2)_{16} = (482)_{10}$

(15) $\because$ 121 contains digit '2'. We cannot represent the number directly in base '2' as digit should be less than base.

$\therefore$ Any value of $r > 2$ satisfy the given equation $\sqrt{121_r} = 11_r$.