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DLD - Assignment

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problem - 1.2

Soln: a) $(20)_{10}$

	Remainder	
$20 \div 2 = 10$	0	LSB
$10 \div 2 = 5$	0	
$5 \div 2 = 2$	1	
$2 \div 2 = 1$	0	
$1 \div 2 = 0$	1	MSB

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

b)

	Remainder	
$110 \div 2 = 55$	0	LSB
$55 \div 2 = 27$	1	
$27 \div 2 = 13$	1	
$13 \div 2 = 6$	1	
$6 \div 2 = 3$	0	
$3 \div 2 = 1$	1	
$1 \div 2 = 0$	1	MSB

$$\therefore (110)_{10} = (1101110)_2$$

c)

$$(250)_{10}$$

	Remainder
$250 \div 2 = 125$	1 LSB
$125 \div 2 = 62$	1
$62 \div 2 = 31$	0
$31 \div 2 = 15$	1
$15 \div 2 = 7$	1
$7 \div 2 = 3$	1
$3 \div 2 = 1$	1
$1 \div 2 = 0$	1 MSB

$$\therefore (250)_{10} = (100000011)_2$$

d)

$$(500)_{10}$$

	Remainder
$500 \div 2 = 250$	0 LSB
$250 \div 2 = 125$	0
$125 \div 2 = 62$	1
$62 \div 2 = 31$	0
$31 \div 2 = 15$	1
$15 \div 2 = 7$	1
$7 \div 2 = 3$	1
$3 \div 2 = 1$	1

$$1 \div 2 = 0$$

$$1 \text{ (MSB)} = 011$$

$$\therefore (500)_{10} = (111110100)_2$$

$$c) (20480)_{10}$$

$$20480 \div 2 = 10240$$

$$10240 \div 2 = 5120$$

$$5120 \div 2 = 2560$$

$$2560 \div 2 = 1280$$

$$1280 \div 2 = 640$$

$$640 \div 2 = 320$$

$$320 \div 2 = 160$$

$$160 \div 2 = 80$$

$$80 \div 2 = 40$$

$$40 \div 2 = 20$$

$$20 \div 2 = 10$$

$$10 \div 2 = 5$$

$$5 \div 2 = 2$$

$$2 \div 2 = 1$$

$$1 \div 2 = 0$$

Remainder

$$011 = \text{LSB}$$

$$0 = 2 \div 11$$

$$0 = 2 \div 8$$

$$0 = 2 \div 4$$

$$0 = 2 \div 2$$

$$0 = 2 \div 1$$

$$0 = 2 \div 0$$

$$0 = 2 \div 0$$

$$0 = 2 \div 0$$

$$0 = 2 \div 0$$

$$0 = 2 \div 0$$

$$0 = 2 \div 0$$

$$0 = 2 \div 0$$

$$1 = 2 \div 0$$

$$0 = 2 \div 0$$

$$1 = 2 \div 0$$

$$1 = \text{MSB}$$

$$\therefore (20480)_{10} = (1010000000000000)_2$$

Problem - 1.3

Solⁿ: a) $(1000)_{10}$

$$1000 \div 2 = 500$$

$$500 \div 2 = 250$$

$$250 \div 2 = 125$$

$$125 \div 2 = 62$$

$$62 \div 2 = 31$$

$$31 \div 2 = 15$$

$$15 \div 2 = 7$$

$$7 \div 2 = 3$$

$$3 \div 2 = 1$$

$$1 \div 2 = 0$$

$$(1000)_{10} = (111101000)_2$$

Remainder

0 LSB

0

0

1

0

1

1

1

1

1

MSB

b) $(10000)_{10}$

$$10000 \div 2 = 5000$$

$$5000 \div 2 = 2500$$

$$2500 \div 2 = 1250$$

$$1250 \div 2 = 625$$

$$625 \div 2 = 312$$

Remainder

LSB

0

0

0

0

1

$$312 \div 2 = 156$$

$$156 \div 2 = 78$$

$$78 \div 2 = 39$$

$$39 \div 2 = 19$$

$$19 \div 2 = 9$$

$$9 \div 2 = 4$$

$$4 \div 2 = 2$$

$$2 \div 2 = 1$$

$$1 \div 2 = 0$$

0

0

0

1

1

1

0

0

1

$$\therefore (10000)_{10} = (10011100010000)_2$$

c) $(100000)_{10}$

$$100000 \div 2 = 50000$$

$$50000 \div 2 = 25000$$

$$25000 \div 2 = 12500$$

$$12500 \div 2 = 6250$$

$$6250 \div 2 = 3125$$

$$3125 \div 2 = 1562$$

$$1562 \div 2 = 781$$

$$781 \div 2 = 390$$

Remainder

0 LSB

0

0

0

0

1

0

1

$$390 \div 2 = 195$$

$$195 \div 2 = 97$$

$$97 \div 2 = 48$$

$$48 \div 2 = 24$$

$$24 \div 2 = 12$$

$$12 \div 2 = 6$$

$$6 \div 2 = 3$$

$$3 \div 2 = 1$$

$$1 \div 2 = 0$$

$$0 \quad 195 = 2 \div 390$$

$$1 \quad 97 = 2 \div 195$$

$$1 \quad 48 = 2 \div 97$$

$$0 \quad 24 = 2 \div 48$$

$$0 \quad 12 = 2 \div 24$$

$$0 \quad 6 = 2 \div 12$$

$$0 \quad 3 = 2 \div 6$$

$$1 \quad 1 = 2 \div 3$$

$$1 \quad \text{MSB} \quad 0 = 2 \div 1$$

$$\therefore (100000)_2 = (110000110100000)_2$$

d) $(1000000)_2$

$$1000000 \div 2 = 500000$$

$$500000 \div 2 = 250000$$

$$250000 \div 2 = 125000$$

$$125000 \div 2 = 62500$$

$$62500 \div 2 = 31250$$

$$31250 \div 2 = 15625$$

$$15625 \div 2 = 7812$$

$$7812 \div 2 = 3906$$

$$3906 \div 2 = 1953$$

Remainder

0

0

0

0

0

0

0

0

1

0

0

0

$$1053 \div 2 = 526$$

$$526 \div 2 = 263$$

$$263 \div 2 = 131$$

$$131 \div 2 = 65$$

$$65 \div 2 = 32$$

$$32 \div 2 = 16$$

$$16 \div 2 = 8$$

$$8 \div 2 = 4$$

$$4 \div 2 = 2$$

$$2 \div 2 = 1$$

$$1 \div 2 = 0$$

$$101 = 5 \div 005$$

$$010 = 5 \div 010$$

$$010 = 5 \div 010$$

$$010 = 5 \div 010$$

$$010 = 5 \div 010$$

$$101 = 5 \div 101$$

$$010 = 5 \div 010$$

$$101 = 5 \div 101$$

$$101 = 5 \div 101$$

$$101 = 5 \div 101$$

$$101 = 5 \div 101$$

$$\therefore (1000000)_{10} = (11110100001001000000)_2$$

problem - 1.6

Soln: a) $(1001)_2$

$$1 \times 2^3 + 0 \times 2^2 + 0 \times 2^1 + 1 \times 2^0 = 8 + 0 + 0 + 1 = 9$$

$$\therefore (1001)_2 = (9)_{10}$$

$$b) (11100)_2$$

$$1 \times 2^4 + 1 \times 2^3 + 1 \times 2^2 + 0 \times 2^1 + 0 \times 2^0 = 16 + 8 + 4 + 0 + 0$$

$$= 28$$

$$\therefore (11100)_2 = (28)_{10}$$

$$c) (111111)_2$$

$$1 \times 2^5 + 1 \times 2^4 + 1 \times 2^3 + 1 \times 2^2 + 1 \times 2^1 + 1 \times 2^0 = 32 + 16 + 8 + 4 + 2 + 1$$

$$= 63$$

$$\therefore (111111)_2 = (63)_{10}$$

$$d) (1010101010)_2$$

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

$$= 2048 + 512 + 128 + 32 + 8 + 2$$

$$= 2730$$

$$\therefore (1010101010)_2 = (2730)_{10}$$

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Problem - 3.1.

Soln: a) $(0111011110)_2$

$$\therefore 0 \times 2^9 + 1 \times 2^8 + 1 \times 2^7 + 1 \times 2^6 + 0 \times 2^5 + 1 \times 2^4 + 1 \times 2^3 + 1 \times 2^2 + 1 \times 2^1 + 0 \times 2^0$$

$$= 0 + 256 + 128 + 64 + 0 + 16 + 8 + 4 + 2 + 0$$

$$= 478$$

\therefore decimal value = $(478)_{10}$.

b) $(1011100111)_2$

$$\therefore 1 \times 2^9 + 0 \times 2^8 + 1 \times 2^7 + 1 \times 2^6 + 1 \times 2^5 + 0 \times 2^4 + 0 \times 2^3 + 1 \times 2^2 + 1 \times 2^1 + 1 \times 2^0$$

$$= 512 + 128 + 64 + 32 + 4 + 2 + 1 = 743$$

\therefore decimal value = $(743)_{10}$.

c) $(3751)_8$

$$\therefore 3 \times 8^3 + 7 \times 8^2 + 5 \times 8^1 + 1 \times 8^0 = 1536 + 448 + 40 + 1$$

$$= 2025$$

\therefore decimal value = 2025.

d) $(A25F)_{16}$ Here, $A=10$ and $F=15$

$$\therefore 10 \times 16^3 + 2 \times 16^2 + 5 \times 16^1 + 15 \times 16^0$$
$$= 40960 + 512 + 80 + 15 = 41567$$

\therefore decimal value $= 41567$.

e) $(F0F0)_{16}$ Here, $F=15$

$$\therefore 15 \times 16^3 + 0 \times 16^2 + 15 \times 16^1 + 0 \times 16^0 = 61440 + 240$$
$$= 61680$$

\therefore decimal value $= 61680$.

Problem - 2.2

Soln: a) $0 \times 2^9 + 1 \times 2^8 + 1 \times 2^7 + 1 \times 2^6 + 0 \times 2^5 + 1 \times 2^4 + 1 \times 2^3 + 1 \times 2^2 + 1 \times 2^1 + 0 \times 2^0$

$$= 256 + 128 + 64 + 16 + 8 + 4 + 2$$

$$= 478$$

\therefore decimal value $= 478$.

b) 1011100111 (1's complement)

$$= -512 + 128 + 64 + 32 + 4 + 2 + 1$$

$$= -281 + 1 = -280$$

\therefore decimal value = -280

c) 111111110 (1's complement)

$$= -512 + 256 + 128 + 64 + 32 + 16 + 8 + 4 + 2$$

$$= -2 + 1 = -1$$

\therefore decimal values = -1

Problem - 3.4

Soln: The numbers are represented as follows:

Decimal	Sign and Magnitude	1's Complement	2's Complement
73	00001001001	000001001001	000001001001
1906	011101110010	011101110010	011101110010
-95	100001011111	111110100000	111110100001
-1630	111001011110	100110100001	100110100010