23i-2088
CY-A
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Date: DLD

Assignment 1

1.1 Base-10 : 16 17 18 19 20 21 22 23 24 25 26 27 28 29
Octal : 20 21 22 23 24 25 26 27 30 31 32 33 34 35 36 37 40
Hex : 10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F 20.
Base-12 : 14 15 16 17 18 19 1A 1B 20 21 22 23 24 25 26 27 28

1.2 a) 32,768 (32×1024) b) 67,108,864 $(64 \times 1024 \times 1024)$ c) 6,871,947,674 $(6.4 \times 1024 \times 1024 \times 102$

1.3 a) $(4310)_5 = 4\times5^3 + 3\times5^2 + 1\times5^1 \times 0\times5^0 = (580)_{10}$

b) $(198)_{12} = 1\times12^2 + 9\times12^1 + 8\times12^0 = (260)_{10}$

c) $(435)_8 = 4\times8^2 + 3\times8^1 + 5\times8^0 = (285)_{10}$

d) $(345)_6 = 3\times6^2 + 4\times6^1 + 5\times6^0 = (137)_{10}$

1.4. 16-Bit binary : 1111 - 1111 - 1111 - 1111

Decimal equivalent : $2^{16} - 1 = (65,535)_{10}$

Hexadecimal eq. : $(FFFF)_{10}$

1.7. $2^3\,2^2\,2^1\,2^0$ | $2^3\,2^2\,2^1\,2^0$ | $2^3\,2^2\,2^1\,2^0$ | $2^3\,2^2\,2^1\,2^0$
6 | 4 | C | D

$(0110 \quad 0100 \quad 1100 \quad 1101)_2$

110 010 011 001 101 => $(62315)_8$
6 2 3 1 5

1.8. a) 215 (1) 107 (1) 53 (1) 26 (1) 13 (0) 6 (1) 3 (0) 1 (1)

$(1111\ 1010)_2 = (FA)_{16}$

b) $(431)_{10} = 26(15)\ 1(10)$ Faster !

$(FA)_{16} = (1111\ 1010)_2$

1.9. a) $2^4\,2^3\,2^2\,2^1\,2^0 \quad 2^{-1}\,2^{-2}\,2^{-3}\,2^{-4}$
$1\ 0\ 1\ 1\ 0 \cdot 0\ 1\ 0\ 1 = 16 + 4 + 2 + 0.25 + 0.625 = 22.3125$

b) $(16.5)_{16} = 1\times16^1 + 6\times16^0 + 5\times16^{-1} = (22.3125)_{10}$

c) $(26.24)_8 = 2\times8^1 + 6\times8^0 + 8^{-1}\times2 + 8^{-2}\times4 = 22.3125.$

d) $(DADA.B)_{16} = 14\times16^3 + 10\times16^2 + 14\times16 + 10\times16^0 + 16^{-1}\times11$

$= 60,138.6875.$

e) $2^3\,2^2\,2^1\,2^0$
$1010 \cdot 1101 = 8 + 2 + 0.5 + 0.25 + 0.0625$

$= 10.8125.$

Date:

1.10 a) $(0001 \cdot 1001)_2 = (1 \cdot 9)_{16} = 1 + 16^{-1} \times 9 = (1.563)_{10}$

b) $(110 \cdot 010)_2 = (0110 \cdot 0100)_2 = (6 \cdot 4)_{16} = 6 + 4 \times 16^{-1} = 6.25$

∴ $(110 \cdot 010)_2$ is same as $(1.10010)_2$ shifted to the left by 2 places

1.11.

```
        1011.11
101 | 111011.0000
      101↓↓
      01001
       101
      1001
       101
      1000
       101
      01110
        101
       001
```

1.12.

a)

```
  01011
 + 101
 10000   = (16)10
```

```
    1011
   ×101
    1011
  1011×
  110111  = (55)10
```

b)

```
   2E : 0010_1110
 + 34 : 0011_0100
```

Ans: $(62)_{16}$. 0110 _ 0010 $= (98)_{10}$

14 + 4 = 18. ⇒ 1×16 + 2

Multiplication:

```
    2E
  × 34
    B8
   8A×
   958
```

56 = 16×3 + 8

42 = 16×2 + 10

21 = 10+11 = 16×1 + 5.

Ans: 958

1.13. a) 27.315

27(1) 13(1) 6(0) 3(1)

1 ⇒ $(11011)_2$

	Int	Quo	co-eff
.315 × 2	0 +	.630	0
.630 × 2	1 +	.26	1
.26 × 2	0 +	.52	0
.052 × 2	1 +	0.04	1

Ans: 11011 . 0101

b) 2/3 = 0.666...

	Int	Quo	co-eff
.6666_6666_67 × 2	1 +	.3333_3333_34	1.
.3333333334 × 2	0 +	.6666666668	0
.06666666668 × 2	1 +	.3333333336	1.
.3333333336 × 2	0 +	.6666666672	0
.6666666672 × 2	1 +	.3333333344	1
.333333344 × 2	0 +	.6666666688	0
.6666666688 × 2	1 +	.3333333376	1
.3333333376 × 2	0 +	.6666666752	0

DALMATIAN

$(.10101010)_2 = 0.5 + 0.125 + 0.313 + .0078$

$= (.6641)_{10}$

c) $(.\underline{1010}\underline{1010})_2 = (.AA)_{16} \Rightarrow 10\times16^{-1} + 10\times16^{-2} = (.6641)_{10}$

1.14. a) 1's complement : $\overset{\downarrow}{1110}\_1111$

2's complement : $r^n - N$

$2^8 - 00010000$

11111111
$-\ 00010000$
$\overline{11110000}$

Ans : 1111_0000

b) 1's comp : 1111_1111

2's comp : $2^8 - 0000\_0000$

100000000
$-\ 00000000$
$\overline{00000000}$

Ans :

c) 1's comp : 0010_0101

2's comp :

11111111
$-\ 00100101$
$\overline{11011010}$

Ans :

d) 1's comp : 0101_0101

2's comp :

11111111
$-\ 01010101$
$\overline{10101010}$

Ans :

e) 1's comp : 0111_1010

2's comp :

11111111
$-\ 01111010$
$\overline{10000101}$

Ans :

f) 1's comp : 0000_0000

2's comp :

11111111
$+\ 00000001$
$\overline{00000000}$

Ans :

1.15. a) 25478036
$+\ 99999999$
$\overline{74,521,963}$

9's comp : →

10's comp : 74,521,964

b) 9's comp : 26,674,399

10's comp : 36,674,400

c) 9's : 74,999,999

10's : 75,000,000

d) 9's comp : 99999999

10's comp : 100000000

1.18. a) 0_10010

1's comp: 1_01101

2's comp: 1_01101 (+1)

1_01110

b) 0_100110

1's comp: 1_011001

2's comp: 1_011001 (+1)

1_011010

c) 1's comp: 1_001010

2's comp: 1_001011

d) 1's comp: 1_101010

2's comp: 1_101011

Diff: 1_01110 + 0_10011

Ans: 0_00001

Diff: 1_011010 + 0_100010

1_111100 (result is -ve)

1's comp: 0_000011

2's comp: 0_000100

000100 (mag)

Diff: 1_001011 − 0_001001

1_010100 (-ve)

1's comp: 0_101011

2's comp: 0_101100

101100 (mag)

Diff: 1_101011 − 0_101000

0_000011 (+ve)

1.20. +49 → 0_110001 (+ve)

+29 → 0_011101 (+ve)

-49 → 1_001110 + 1 → 1_001111

-29 → 1_100011

a) +29 + (-49) = 0_011101 + 1_001111

1_101100

Mag = 0_010011 + 1 = 0_010100 ⇒ $(20)_{10}$

b) (-29) + (+49) = 1_100011 + 0_110001

0_010100 ⇒ $(20)_{10}$