Conversions.

I i) Binary to Decimal

1) $(110110)_2 = 2^5\times1 + 2^4\times1 + 2^3\times0 + 2^2\times1 + 2^1\times1 + 2^0\times0$

$= 32 + 16 + 0 + 4 + 2 + 0$

$= (54)_{10}$

2) $(1011.1011)_2 = 2^3\times1 + 2^2\times0 + 2^1\times1 + 2^0\times1 + 2^{-1}\times1 + 2^{-2}\times0 + 2^{-3}\times1 + 2^{-4}\times1$

$= 8 + 0 + 2 + 1 + \frac{1}{2} + 0 + \frac{1}{8} + \frac{1}{16}$

$= 11 + \frac{1}{2} + \frac{1}{8} + \frac{1}{16}$

$= \frac{11\times16 + 1\times8 + 1\times2 + 1}{16} = \frac{176+8+2+1}{16} = \frac{187}{16}$

$= (11.6875)_{10}$

ii) Binary to Octal

1) $(1001010)_2 = (?)_8$

$= 1001010$

$= 001\ 001\ 010$

$= 1\ 1\ 2$

$= (112)_8$

2) $(1101.1011)_2 = (?)_8$

1101.1011 = 001 101 . 110 110

= 1 5 . 6 6

= $(15.66)_8$

iii) Binary to Hexadecimal

1) $(100111010)_2 = (?)_{16}$

100111010 = 0001 0011 1010

= 1 3 A

= $(13A)_{16}$

2) $(100101110.11101)_2 = (?)_{16}$

100101110 . 11101 = 0001 0010 1110 . 1110 1000

= 1 2 14 . 14 8

= 1 2 E . E 8

= $(12EE8)_{16}$

II i) Decimal to Binary

1) $(29)_{10} = (?)_2$

| | | |
|---|---|---|
| 2 | 29 | 1 |
| 2 | 14 | 0 |
| 2 | 7 | 1 |
| 2 | 3 | 1 |
| 2 | 1 | 1 |
| | 0 | |

LSB

MSB

$\therefore (29)_{10} = (11101)_2$

2) $(0.6875)_{10} = (?)_2$

| | | |
|---|---|---|
| 0.6875 × 2 | 1.375 | 1 |
| 0.375 × 2 | 0.75 | 0 |
| 0.75 × 2 | 1.5 | 1 |
| 0.5 × 2 | 1 | 1 |

MSB

LSB

$\therefore (0.6875)_{10} = (1011)_2$

ii) Decimal to octal

1) $(255)_{10} = (?)_8$

| | | |
|---|---|---|
| 8 | 255 | 7 |
| 8 | 31 | 7 |
| 8 | 3 | 3 |
| | 0 | |

$\therefore (255)_{10} = (377)_8$

2) $(177.25)_{10} = (?)_8$

| | | |
|---|---|---|
| 8 | 177 | 1 |
| 8 | 22 | 6 |
| 8 | 2 | 2 |
| | 0 | |

| | | |
|---|---|---|
| 0.25×8 | 2.0 | 2 |
| 0.00×8 | 0.0 | 0 |

$\therefore (177.25)_{10} = (261.20)_8$

iii) Decimal to Hexadecimal

i) $(2001.43)_{10} = (?)_{16}$

| | | |
|---|---|---|
| 16 | 2001 | 1 |
| 16 | 125 | 13 D ↑ |
| 16 | 7 | 7 |
| | 0 | |

| | | |
|---|---|---|
| 0.43×16 | 6.88 | 6 |
| 0.88×16 | 14.08 | 14 E ↓ |
| 0.08×16 | 1.28 | 1 |
| 0.28×16 | 4.48 | 4 |
| 0.48×16 | 7.68 | 7 |
| 0.68×16 | 10.88 | 10 A ↕ |
| 0.88×16 | 14.08 | 14 E |

$(2001.43)_{10} = (7D1.6E147AE1)_{16}$

III i) Octal to Binary

i) $(437.21)_8 = (?)_2$

| 4 | 3 | 7 | . | 2 | 1 |
|---|---|---|---|---|---|
| 100 | 011 | 111 | . | 010 | 001 |

$\therefore (437.21)_8 = (100\,011\,111.010\,001)_2$

ii) Octal to Decimal

1) $(250)_8 = (?)_{10}$

$(250)_8 = 2\times8^2 + 5\times8^1 + 0\times8^0$

$= 2\times64 + 5\times8 + 0$

$= 128 + 40$

$\therefore (250)_8 = (168)_{10}$

2) $(35.7)_8 = (?)_{10}$ $(8^0 = 1)$

$(35.7)_8 = 3\times8^1 + 5\times8^0 + 7\times8^{-1}$

$= 24 + 5\times1 + 7\times\frac{1}{8}$

$= 24 + 5 + \frac{7}{8} = 29 + \frac{7}{8}$

$= \frac{29\times8+7}{8} = \frac{232+7}{8} = \frac{239}{8}$

$(35.7)_8 = (29.875)_{10}$

iii) Octal to Hexadecimal

1) $(537)_8 = (?)_{16}$

(1) convert octal to binary $\begin{matrix}5 & 3 & 7\end{matrix}$

$= (101\ \ 011\ \ 111)_2$

(2) convert Binary to Hexadecimal

$(101011111)_2 = 0001\ \ 0101\ \ 1111 = (15F)_{16}$

IV i) Hexadecimal to Binary.

1) $(57EB.AD)_{16} = (?)_2$

5 7 E B · A D

= 0101 0111 1110 1011 · 1010 1101

= $(0101011111101011.10101101)_2$

2) $(D283)_{16} = (?)_2$

D 2 8 3

= 1101 0010 1000 0011

= $(1101001010000011)_2$

ii) Hexadecimal to Decimal

(1) $(268)_{16} = (?)_{10}$

$= 2\times16^2 + 6\times16^1 + 8\times16^0 = 512 + 96 + 8 = (616)_{10}$

(2) $(11A.62)_{16} = (?)_{10}$

$= 1\times16^2 + 1\times16^1 + 10\times16^0 + 6\times16^{-1} + 2\times16^{-2}$

$= 256 + 16 + 10 + \frac{6}{16} + \frac{2}{256}$

$= \frac{(282\times256) + (6\times16) + 2}{256} = \frac{72192 + 96 + 2}{256} = \frac{72290}{256}$

$(11A.62)_{16} = (282.382)_{10}$

iii) Hexadecimal to Octal.

① $(5CB.12E)_{16} = (?)_8$

i) Convert Hexadecimal to Binary

5 C B . 1 2 E

$= (0101\ 1100\ 1011 . 0001\ 0010\ 1110)_2$

ii) Convert Binary to octal.

$010\ 111\ 001\ 011 . 000\ 100\ 101\ 110$

$= 2\ 7\ 1\ 3 . 0\ 4\ 5\ 6$

$= (2713.0456)_8$

② $(78.4B)_{16} = (?)_8$

i) Hexadecimal to Binary

7 8 . 4 B

$(0111\ 1000 . 0100\ 1011)_2$

ii) Binary to octal

$01\ 111\ 000 . 010\ 010\ 11$

$= 001\ 111\ 000 . 010\ 010\ 110$

$= (170.226)_8$