COSC 2406
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(1) 39 to hexadecimal.

$$16\overline{)39}\quad 2$$
32
7

$$16\overline{)7}\quad 0$$
0
7

39/16 = 2 R = 7
2/16 = 0 R = 2

$\boxed{27}$

(2) 78

$$16\overline{)78}\quad 4$$
64
14

~~4/16 = 0~~

R: 14 (E in decimal).

(3) 221

$$16\overline{)221}\quad 13$$
16
061
48
13

13 = D

(4) 145

145/16 =

$$16\overline{)145}\quad 9$$
144
001

② Binary Representation.

① $2\overline{)39}$ 19
2
19
18
01

$Q = 19$, $R = 1$

$19/2 = Q : 9$, $R = 1$
$9/2 = Q = 4$, $R = 1$
$4/2 = Q = 2$, $R = 0$
$2/2 = Q = 1$, $R = 0$
Final Quotient is 1 & R = 1, 1, 1, 0, 0 & 1
Binary = $(111001)_2$
Adding two zeros, we get $(00100111)_2$

② 78
$78/2 = Q = 39$, $R = 0$
$39/2$ $Q = 19$, $R = 1$
$19/2 = Q = 9$, $R = 1$
$9/2$ $Q = 4$, $R = 1$
$4/2$ $Q = 2$, $R = 0$
$2/2$ $Q = 1$, $R = 0$
The final Quotient is 1.
binary equivalent is $(1001110)_2$ 1

Adding one zero, we get $(01001110)_2$.

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(3) 221

221 / 2 = q = 110, R = 1
110 / 2 = q = 55, R = 0
55 / 2 = q = 27, R = 1
27 / 2 = q = 13, R = 1
13 / 2 = q = 6, R = 1
6 / 2 = q = 3, R = 1
3 / 2 = q = 1, R = 1

final Quotient is 1
and 1, 0, 1, 1, 1, 0 and 1.
The binary equivalent is $(11011101)_2$

(4) 145
145 / 2 = q = 72, R = 1
72 / 2 = q = 36, R = 0
36 / 2 = q = 18, R = 0
18 / 2 = q = 9, R = 0
9 / 2 = q = 4, R = 1
4 / 2 = q = 2, R = 0
2 / 2 = q = 1, R = 0

final Quotient is 1
and 0, 0, 1, 0, 0, 0 and 0

binary equivalent is $(10010001)_2$.

③ Unsigned Decimal Values :-

① 11101101b

$(1\times2^7)+(1\times2^6)+(1\times2^5)+(0\times2^4)$
$+(1\times2^3)+(1\times2^2)+(0\times2^1)+$
(1×2^0)

$=128+64+32+0+8+4+0+1$

$\boxed{=237}$

② 00011011b

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

$=0+0+0+16+8+0+2+1$

$\boxed{=27}$

③ 11110101b

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

$=128+64+32+16+0+4+0+1$

$\boxed{=245}$

(4) 01100100b

$(0\times2^7)+(1\times2^6)+(1\times2^6)+(1\times2^5)+$
$(0\times2^4)+(0\times2^3)+(1\times2^2)+(0\times2^1)+$
(0×2^0)

$=0+64+32+0+0+4+0+0$

$\boxed{=100}$

(6) Signed Decimal Value:

(1) 11101101b   Leftmost bit = 1 indicates a -ve no.

$=-(00010011b+1)=-(00010100b)$

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

$=-(0+0+0+16+0+4+0+0)$
$=-(20)$
$\boxed{=-20}$

~~(2) 00011011b = -(00010101b + 1)~~
~~= -(00001100b)~~
~~= -(0x2^7) + (~~

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(b) 00011011b

$(0 \times 2^7) + (0 \times 2^6) + (0 \times 2^5) + (1 \times 2^4) + (1 \times 2^3) + (0 \times 2^2) + (1 \times 2^1) + (1 \times 2^0)$

$0 + 0 + 0 + 16 + 8 + 0 + 2 + 1$

$\boxed{= 27}$

(c) 11110101b

$= -(00001011b + 1)$

$= -(00001100b)$

$= -(0 \times 2^7) + (0 \times 2^6) + (0 \times 2^5) + (0 \times 2^4) + (1 \times 2^3) + (1 \times 2^3) + (1 \times 2^2) + (0 \times 2^1) + (0 \times 2^0)$

$= -(0 + 0 + 0 + 0 + 8 + 4 + 0 + 0)$

$= -(12)$

$\boxed{= -12}$

(d) 01100100b

$(0 \times 2^7) + (1 \times 2^6) + (1 \times 2^5) + (0 \times 2^4) + (0 \times 2^3) + (1 \times 2^2) + (0 \times 2^1) + (0 \times 2^0)$

$= 0 + 64 + 32 + 0 + 0 + 4 + 0 + 0$

$\boxed{= 100}$

(3) A = 01100100b
B = 10011010b
C = 01101101b
D = 11000110b

(a) A V B
01100100b V 10011010b
Result = 11111110b

(b) A V C
01100100b V 01101101b
Result = 01101101b

(c) A V B
01100100b V 11000110b
Result = 11100110b.

(b) A ∧ B
01100100b ∧ 10011010b
= 00000000b

A ^ C
01100100b ^ 01101101b
01100100b

A ⊕ D
01100100b ⊕ 11000110b
Result = 10100010b.

(4) $Q = 71AF2523h$
$R = 2B988398h$
$S = 9E5E4AD8h$
$T = 6B7C3487h.$

(1) $Q + R$
$71AF2523h + 2B988398h$
Decimal $= 1930950275 + 731113240$

Method 1

$Q + R = 1930950275 + 731113240$
Decimal $= 2662063515$

Convert back to hexadecimal
9E3F674Bh (no carry).

(2) & if we do it like

Method 2

$$
\begin{array}{r}
71AF2523h \\
+\ 2B988398h \\
\hline
9D3789BB
\end{array}
$$

(no carry)

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(2) Q + S

  71AF2523
+ 9E5E4AD8

1100D7FB (carry 1)

(3) Q + T

  71AF2523
+ 6B7C3847

DD2B59AA (carry 1)

(b)

Q − R

  71AF2523h
− 2B988398h

46179A8Bh (no carry)

Q − S

  71AF2523h
− 9E5E4AD8h

71AF2523h + 61 9BB527h + 1

$\boxed{= D39A7F4Bh}$ carry 1.

Q - T

7 1 A F 2 5 2 3 h
6 B 7 C 3 4 8 7 h

7 1 A F 2 5 2 3 h +
9 4 8 3 C B 7 8 h +
1

$\boxed{= 0A32F09Ch}$

(carry 1)

* 2's Complement Method :

(1) Q - R
find the 2's complement of R

2B988398 → D4677C67

D 4 6 7 7 C 6 7
\+ 1

2's complement of R → D 4 6 7 7 C 6 8

7 1 A F 2 5 2 3
\+ D 4 6 7 7 C 6 8

1 1 6 0 5 2 1 8 B (no carry).

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(2) Q-S

$\therefore$ S = 9E5E4AD8h

9E5E4AD8h → 61A1B527

$$\begin{array}{r} 61A1B527 \\ +\quad\quad\quad 1 \\ \hline 61A1B528 \end{array}$$

$$\begin{array}{r} 71AF2523 \\ +\ 61A1B528 \\ \hline D35E77AB \end{array}$$

(3) Q-T

6B7C3487 → 9483CB78

$$\begin{array}{r} 9483CB78 \\ +\quad\quad\quad 1 \\ \hline 9483CB79 \end{array}$$

Perform addition of Q
2's complement
of T.

$$\begin{array}{r} 71AF2523 \\ +\ 9483CB79 \\ \hline 0162F09A2 \end{array}$$ (no carry).