COSC2406F18 – Assembly Language Programming

Assignment 1 ***Use the Assignment#1 Submission form provided and SHOW ALL YOUR WORK (either in the same document or as a separate PDF scan). NO SUPPORT = 50% PENALTY***

All your calculation work must be provided with the assignment – but a summary of all answers is to be included as the cover page using the WORD file accompanying this assignment.

Due: Monday September 17th, 2018 by 11:55pm

1. **[10] Using Number Set #1 (five decimal numbers) provided to you for this assignment and presuming an 8-bit number system (meaning that all numbers are 8-bits in size), convert each of the following numbers into:**
   a. **Hexadecimal representation**
   b. **Binary representation**

> **Example: If the number is 144**
> **HEX: 144 = 90h**
> **Binary: 144 = 10010000b**

2. **[10] Show the compliments for each of the numbers calculated in Question 1 above.**

> **Example:**
> **16's compliment of 90h ➔ 6Fh (invert each digit: F-9 = 6 and F-0 = F)**
> **+1h (add one)**
> **70h**
> **2's compliment of 10010000b ➔ 01101111b (invert each digit)**
> **+ 00000001b (add one)**
> **01110000b**

3. **[15] Using Number Set #2 (five binary numbers) provided to you for this assignment, show the value of each number as:**
   a. **An unsigned decimal value**
   b. **A signed decimal value**
   c. **A HEX value**

> **Example:**
> **If the binary number is 10101001b then**
> **Unsigned decimal: 2^7 + 2^5 + 2^3 + 2^0 = 169**
> **Signed decimal: 10101001b is negative ➔ 01010111b is 2's compliment**
> **= -(2^6 + 2^4 + 2^2 + 2^1 + 2^0) = -87**
> **Hex: 1010 1001b = 0A9h (note the 0 is required because the answer starts with A)**

4. **[20] Using Number Set #2 (five binary numbers) provided to you for this assignment where the first number is considered to be A, the second number B, the third C, etc… calculate each of the following:**
   a) **A + B, A + C, A + D, A + E** **(show the carry value – 9th bit)**
   b) **A - B, A - C, A - D, A - E** **(use the 2's compliment method: A- C → A + (-C))**
   c) **A ^ B, A ^ C, A ^ D, A ^ E** **(^ is the symbol for the AND operation)**
   d) **A v B, A v C, A v D, A v E** **(v is the symbol for the OR operation)**
   e) **A ⊕ B, A ⊕ C, A ⊕ D, A ⊕ E** **(⊕ is the symbol for the XOR operation)**

Example: **Where A is 01010110b and B is 11011000b:**

A + B →

```
  01010110
+ 11011000
1 00101110    ← always show the carry bit
```

A - B →

```
  01010110 →  01010110
- 11011000 → + 00101000   ← add the 2's compliments
              0 01101110   ← always show the carry bit
```

A ^ B	A v B	A ⊕ B
01010110	01010110	01010110
11011000	11011000	11011000
01010000	11011110	10001110

5. **[5] Using Number Set #3 (five hexadecimal numbers) provided to you for this assignment, convert each to their binary form.**

Example: If the hexadecimal number is F618D5A4h, the binary form is:

```
F    6    1    8    D    5    A    4
1111 0110 0001 1000 1101 0101 1010 0100

F618D5A4h →  1111 0110 0001 1000 1101 0101 1010 0100b
```

6. **[20] Using Number Set #3 (five hexadecimal numbers) provided to you for this assignment where the first number is considered to be Q, the second number R, the third S, etc… calculate each of the following:**

   f) **Q + R, Q + S, Q + T, Q + U** **(show the carry value – 9th digit)**

   g) **Q - R, Q - S, Q - T, Q - U** **(use the 16's compliment method: Q - S → Q + (-S))**

   h) **Q ^ R, Q ^ S, Q ^ T, Q ^ U** **(^ is the symbol for the AND operation)**

   i) **Q v R, Q v S, Q v T, Q v U** **(v is the symbol for the OR operation)**

   j) **Q ⊕ R, Q ⊕ S, Q ⊕ T, Q ⊕ U** **(⊕ is the symbol for the XOR operation)**

Example: **Where Q is F618D5A4h and B is 0447038Ch:**

A + B →

```
  F618D5A4
+ 0447038C
0 FA5FD930    ← always show the carry bit
```

A - B →

```
  F618D5A4 →  F618D5A4
- 0447038C →  + FBB8FC74   ← add the 16's compliments
              1 F1D1D218   ← always show the carry bit
```

A ^ B	A v B	A ⊕ B
F618D5A4	F618D5A4	F618D5A4
0447038C	0447038C	0447038C
04000184	F65FD7AC	F25FD628

Submit your completed assignment electronically via CMS. An upload link has been provided. All final answers for each question must be provided using the MS Word file supplied with the assignment (typed in the form) and using the numbers assigned to you. Support for all your answers must be attached as a PDF or the support can be types into a Word or OpenOffice document. Final submissions must be legible or they will not be graded.

Double check the PDF when submitting – everything must be clear.