**Subject: PRF192- PFC**

**Workshop 01**

**Objectives:**

1. Reviewing for number systems
2. Exploring memory of a C program

**Recommendations**

Part 1: Students do exercises using notebooks

Part 2: Students develop programs, run them, write down their memory structure to notebooks.

**Part 1: Number systems**

**Exercise 1** **(2 marks): Convert decimal numbers to binary ones**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Decimal** | **4-bit Binary** | **Decimal** | **8-bit Binary** | **Decimal** | **16-bit Binary** |
| 9 | 1001 | 7 | 0000 0111 | 255 | 0000 0000 1111 1111 |
| 7 | 0111 | 34 | 0010 0010 | 192 | 0000 0000 1100 0000 |
| 2 | 0010 | 125 | 0111 1101 | 188 | 0000 0000 1011 1100 |
| 15 | 1111 | 157 | 1001 1101 | 312 | 0000 0001 0011 1000 |
| 12 | 1100 | 162 | 1010 0010 | 517 | 0000 0010 0000 0101 |
| 11 | 1011 | 37 | 0010 0101 | 264 | 0000 0001 0000 1000 |
| 6 | 0110 | 66 | 0100 0010 | 543 | 0000 0010 0001 1111 |
| 5 | 0101 | 77 | 0100 1101 | 819 | 0000 0011 0011 0011 |
| 8 | 1000 | 88 | 0101 1000 | 1027 | 0000 0100 0000 0011 |
| 13 | 1101 | 99 | 0110 0011 | 2055 | 0000 1000 0000 0111 |
| 14 | 1110 | 109 | 0110 1101 | 63 | 0000 0000 0011 1111 |

**Exercise 2(2 marks): Convert decimal numbers to binary and hexadecimal ones**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Decimal** | **Binary** | **Hexa.** | **Decimal** | **16-bit Binary** | **Hexadecimal** |
| 9 | 1001 | 9 | 255 | 0000 0000 1111 1111 | 00FF |
| 127 | 0111 1111 | 7F | 192 | 0000 0000 1100 0000 | 00C0 |
| 125 | 0111 1101 | 7D | 188 | 0000 0000 1011 1100 | 00BC |
| 157 | 1001 1101 | 9D | 312 | 0000 0001 0011 1000 | 0138 |
| 162 | 1010 0010 | A2 | 517 | 0000 0010 0000 0101 | 0205 |
| 37 | 0010 0101 | 25 | 264 | 0000 0001 0000 1000 | 0108 |
| 66 | 0100 0010 | 42 | 543 | 0000 0010 0001 1111 | 021F |
| 77 | 0100 1101 | 4D | 819 | 0000 0011 0011 0011 | 0333 |
| 88 | 0101 1000 | 58 | 1027 | 0000 0100 0000 0011 | 0403 |
| 99 | 0110 0011 | 63 | 2055 | 0000 1000 0000 0111 | 0807 |
| 109 | 0110 1101 | 6D | 63 | 0000 0000 0011 1111 | 003F |

**Exercise 3(2 marks): Compute**

(b: binary, q: octal, h: hexadecimal)

**3245q + 247q = 3514q = 11 101 001 100b**

**1A7Bh + 26FE7h = 28A62h = 0010 1000 1010 0110 0010b**

**1101101101b - 10110111b = 10 1011 0110b**

**3654q – 337q =3315q = 011011001101b**

**3AB7h – 1FAh = 38BDh = 0011 1000 1011 1101b**

**36Ah – 576q = 1ECh = 111101100b**

**64AEh – 1001101b= 62141 q**

101101111 b

+ 100111011 b

110110001 b

110001101 b

10111101000 b

1011010 b\* 1011b = 11 1101 1110b

1101000b + 2AB h + 345 q = 3F8h =1770q

3AFh / 1Ch =100001 b dư 10011 = 33d

3ACh – 562q = 1000111010 b = 570 d

3FFA h / 327q = 1001100b dư 100110b = 76 d

**Exercise 4 (2 marks)**

1. Show binary formats of 1-byte unsigned numbers: 251 , 163, 117

251=1111 1011b

163=1010 0011b

117=0111 0101b

1. Show binary formats of 2-byte unsigned numbers: 551 , 160, 443

551=0000 0010 0010 0111b

160=0000 0000 1010 0000b

443=0000 0001 1011 1011b

1. Show binary formats of 1-byte signed numbers: -51 , -163, -117, 320

-51= 1100 1100

-163= 0101 1100

-117= 1000 1010

320= 1 0100 0000 hay không biểu diễn được

1. Show the decimal values of 1-byte unsigned representations: :

01100011 b , 10001111 b , 11001010 b , 01001100 b

01100011b= 99d

10001111b= 143d

11001010b= 202d

01001100b= 76d

**Part 2: Explore memory structure of programs**

**Sample**

**Complete the code of following program then draw it’s memory structure**

**(2 marks)**

