CSI104: Foundations Of Computer Science

**Duration: 90’**

**Lab 1:**

**Scoring scale: 10**

**Exercise 1** **(2.5 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 | 1011 | 162 | 0010 0101 | 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 (2.5marks): 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 (2.5 marks): Compute** (b: binary, q: octal, h: hexadecimal, d: decimal)

**3245q + 247q = 3514q = 011101001100b**

**1A7Bh + 26FE7h = 28A62h = 00101000101001100010b**

**1101101101b - 10110111b =1010110110b**

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

**3AB7h – 1FAh = 38BDh =0011100010111101b**

**36Ah – 576q = 1ECh = 000111101100b**

**64AEh – 1001101b= 62141q**

101101111b

+ 100111011b

110110001b

110001101b

10111101000b

1011010b\* 1011b=1111011110b

1101000b + 2ABh + 345q = 3E8h = 1770q

3AFh / 1Ch =00100001b = 33d

3ACh – 562q = 001000111010b = 570d

3FFAh / 327q = 01001100b = 76d

**Exercise 4 (2.5 marks)**

1. Show binary formats of 1-byte unsigned numbers: 251, 163, 117
2. Show binary formats of 2-byte unsigned numbers: 551, 160, 443
3. Show binary formats of 1-byte signed numbers: -51, -163, -117, 320
4. Show the decimal values of 1-byte unsigned representations: :

01100011b, 10001111b, 11001010b, 01001100b

1-

* 251 = 1111 1011b
* 163 = 1010 0011b
* 117 = 0111 0101b

2-

* 551 = 0000 0010 0010 0111b
* 160 = 0000 0000 1010 0000b
* 443 = 0000 0001 1011 1011b

3-

* -51 = 1100 1101
* -163 = 1111 1111 0101 1101
* -117 = 1111 1111 1000 1011
* 320 = 1110 1100

4-

* 01100011b = 99d
* 10001111b = 143d
* 11001010b = 202d
* 01001100b = 76d