Name: Matthew Zaldana

CECS 225 – Computer Architecture

Assignment #01 Number Systems Due: 9/1/2020 (8am)

***Note: Here signed binary, octal, or hex values implies usage of 2’s complement encoding.***

1. Convert the following decimals to 8-bit unsigned binary:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Decimal | 8-bit binary equivalent | | | | | | | |
| 137 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 56 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 |
| 83 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 |
| 222 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 |
| 175 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 |

1. Convert the following decimals to 8-bit signed binary (2’s complement):

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Decimal | 8-bit binary equivalent | | | | | | | |
| - 49 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 |
| -239 | X | X | X | X | X | X | X | X |
| -95 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| -200 | X | X | X | X | X | X | X | X |
| -101 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 |

1. Convert the following decimals to 16-bit signed hexadecimal:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Decimal | 16-bit hex equivalent | | | |
| 10477 | 2 | 8 | E | D |
| 23948 | 5 | D | 8 | C |
| -33395 | X | X | X | X |
| -2000 | F | 8 | 3 | 0 |
| -10101 | D | 8 | 8 | B |

1. Convert the following 16-bit signed hexadecimal numbers to signed decimal:

|  |  |
| --- | --- |
| Hex Value | Signed decimal equivalent |
| DE28 | 56,872 |
| CCC5 | 52,421 |
| 543A | 21,562 |
| 044F | 1,103 |
| F0F0 | 61,680 |

1. Convert the following decimals to the equivalent number in the radix given using the fewest digits.

|  |  |  |
| --- | --- | --- |
| Radix | Decimal | Radix equivalent number |
| 8 | 4579 | 10743 |
| 4 | 243 | 3303 |
| 12 | 3000 | 18A0 |
| 6 | 97 | 241 |
| 3 | 100 | 10201 |

3.

a. 10477

i. 10477 / 16 = 654, R = 13 = D;

ii. 654 / 16 = 40, R = 14 = E;

iii. 40 / 16 = 2, R = 8 = 8

iv. 2 / 16 = 0, R = 2 = 2

b. 23948

i. 23948 / 16 = 1496, R = 12 = C

ii. 1496 / 16 = 93, R = 8 = 8

iii. 93 / 16 = 5, R = 13 = D

iv. 5 / 16 = 0, R = 5 = 5

c. -33395

i. 33395 / 16 = 2087, R = 3, 15 – 3 = 12 = C + 1 = D

ii. 2087 / 16 = 130, R = 7, 15 – 7 = 8 = 8

iii. 130 / 16 = 8, R = 2, 15 – 2 = 13 = D

iv. 8 / 16 = 0, R = 8, 15 - 8 = 7 = 7

d. -2000

i. 2000 / 16 = 125, R = 0, 15 – 0 = 15 = F + 1 = 0

ii. 124 / 16 = 7, R = 12, 15 – 12 = 3 = 3

iii. 7 / 16 = 0, R = 7, 15 – 7 = 8 = 8

iv. 0 / 16 = 0, R = 0, 15 – 0 = 15 = F

e. -10101

i. 10101 / 16 = 631, R = 5, 15 – 5 = 10 = A + 1 = B

ii. 631 / 16 = 39, R = 7, 15 – 7 = 8 = 8

iii. 39 / 16 = 2, R = 7, 15 – 7 = 8 = 8

iv. 2 / 16 = 0, R = 2, 15 – 2 = 13 = D

4.

a. DE28

i. D = 13 \* 163 = 53248

ii. E = 14 \* 162 = + 3584

iii. 2 = 2 \* 161 = +32

iv. 8 = 8 \* 160 = 8

b. CCC5

i. C = 12 \* 163 = 49152

ii. C = 12 \* 162 = + 3072

iii. C = 12 \* 161 = + 192

iv. 5 = 5 \* 160 = + 5

c. 543A

i. 5 = 5 \* 163 = 20480

ii. 4 = 4 \* 162 = + 1024

iii. 3 = 3 \* 161 = + 48

iv. A = 10 \* 160 = +10

d. 044F

i. 0 = 0 \* 163 = 0

ii. 4 = 4 \* 162 = + 1024

iii. 4 = 4 \* 161 = + 64

iv. F = 15 \*160 = +15

e. F0F0

i. F = 15 \* 163 = 61440

ii. 0 = 0 \* 162 = + 0

iii. F = 15 \* 161 = + 240

iv. 0 = 0 \* 160 = + 0

5

a.45799

i.4579 / 8 = 572, R = 3

ii. 572 / 8 = 71, R = 4

iii. 71 / 8 = 8, R = 7

iv. 8 / 8 = 1, R = 0

v. 1 / 8 = 0, R = 1

b. 2434

i. 243 / 4 = 60, R = 3

ii. 60 / 4 = 15, R = 0

iii. 15 / 4 = 3, R = 3

iv. 3 / 4 = 0, R = 3

c. 300012

i. 3000 / 12 = 250, R = 0

ii. 250 / 12 = 20, R = 10 🡪 A

iii. 20 / 12 = 1, R = 8

iv. 1 / 12 = 0, R = 1

d. 976

i. 97 / 6 = 16, R = 1

ii. 16 / 6 = 2, R = 4

iii. 2 / 6 = 0, R = 2

e. 1003

i. 100 / 3 = 33, R = 1

ii. 33 / 3 = 11, R = 0

iii. 11 / 3 = 3, R = 2

iv. 3 / 3 = 1, R = 0

v. 1 / 3 = 0, R = 1