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CSC3222: Computer Architecture and Organization II Assignment

Q23. The two-byte entry shown below can be interpreted in a number of ways.

VALUE DC X'021D'

- a) What is its decimal value if it is interpreted as an unsigned binary integer?
- b) What is its decimal value if it is interpreted as a packed decimal value?

Solutions

23a) Two byte entry here refers to hexadecimal numbers (Hex). We can tell it is a hexadecimal number because it starts with **0X**. The hexadecimal number system has 16 symbols (base 16) instead of the decimal system which has 10 numbers [0-9].

The hex symbols are: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, and F.

Where **A = 10, B = 11, C = 12, D = 13, E = 14 and F = 15**.

The 0X indicates that it is a hex number and that is the only purpose of 0X. Thus to convert a hex number such as 0X021D to decimal if it is interpreted as an unsigned binary integer, we only need to look at the symbols after 0X which are **(021D)**.

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To convert the hex number (0X021D) to decimal (or any other hexadecimal number) we follow two steps:

Step One:

$$D \times 16^0 = 13 \text{ (D = 13 in decimal)}$$

$$1 \times 16^1 = 16$$

$$2 \times 16^2 = 512$$

$$0 \times 16^3 = 0$$

Step Two:

Then we add up all the products we got from step (1) to get the answer in decimal.

$$13 + 16 + 512 + 0 = 541$$

23b) Packed decimal specifies a method of encoding decimal numbers by using each byte to represent two digits. It stores decimal digits in each “nibble” (A nibble is half of a byte) of a byte. Each byte has two nibbles, and each nibble is indicated by a hexadecimal digit.

The sign is indicated by last nibble with formats, C indicates a positive value, and D indicates a negative value with the formats. A, C, E, and F indicate negative values.

Therefore the hexadecimal number **0X021D** if it's treated as a packed decimal value will be **-21** taking D to be the sign.