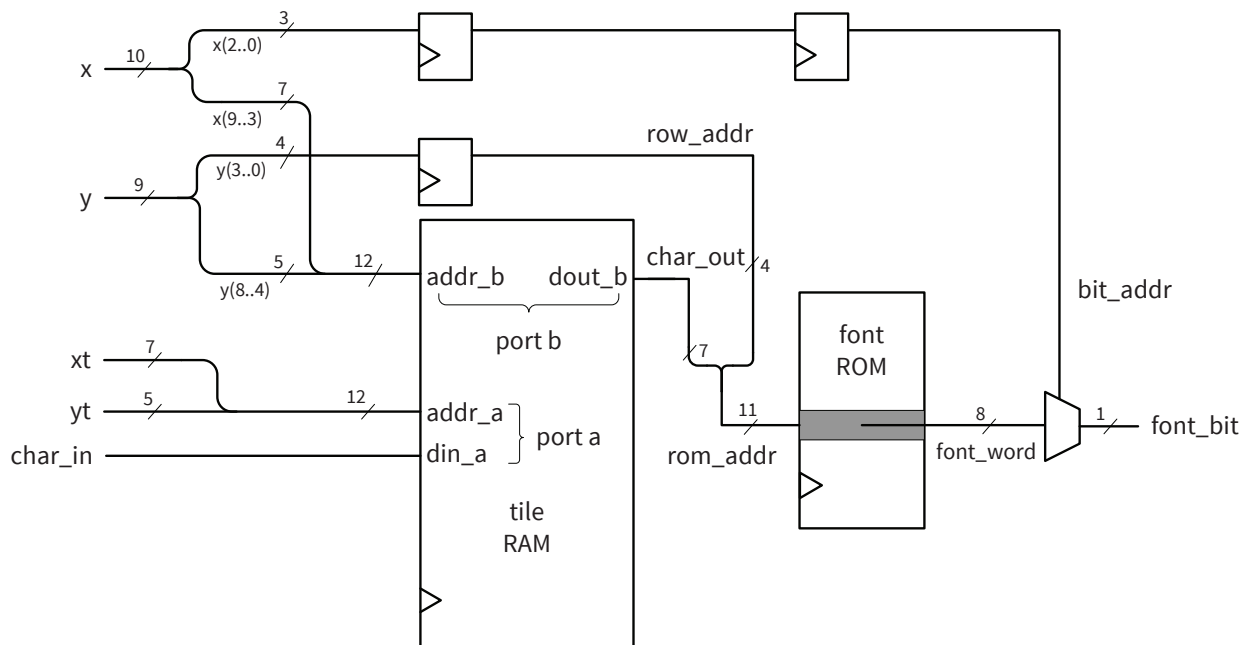


## Class Exercise Solutions



**1. Provide the following information about the tile RAM:**

- A. Type of memory (single-port or dual-port): **dual-port**
- B. Total number of words (number of locations in memory):  **$2^{12} = 4k = 4096$**
- C. Size of each word (a single location in memory): **7 bits**
- D. Total size of memory in kbits:  **$4k \cdot 7 \text{ bits} = 28 \text{ kbits}$**
- E. Number of words used to hold ASCII codes of tiles:  **$80 \cdot 30 = 2400$**
- F. Utilization of memory in % (E/B\*100%):  **$(2400/4096) \cdot 100\% = 58.6\%$**
- G. Address of the location holding ASCII code of the tile with coordinates (0, 1), i.e., the first tile of the second row:  **$2^7 = 128_{10} = 0x80$**

**2. Provide the following information about the font ROM:**

- A. Type of memory (single-port or dual-port): **single-port**
- B. Total number of words (number of locations in memory):  **$2^{11} = 2k = 2048$**
- C. Size of each word (a single location in memory): **8**
- D. Total size of memory in kbits:  **$2k \cdot 8 \text{ bits} = 16 \text{ kbits}$**
- E. Number of words used to describe a font pattern of a single character: **16**
- F. Total number of font patterns stored in this memory:  **$2^{11}/2^4 = 2^7 = 128$**
- G. Range of locations in this memory used to represent a font pattern of a character with an ASCII code 48 decimal = 30 hex (this character is digit 0):  **$0x300-0x30F$**