

Q1.

10 marks

Consider an I/O bus that can transfer 5 bytes of data in one bus cycle and keeping in mind that the maximum frequency of the bus is 40 MHz. Suppose that a designer is considering to attach the following two components to this bus:

Hard drive, with a transfer rate of 80 Mbytes/sec and Video card, with a transfer rate of 140 Mbytes/sec. What will be the implications?

Solution:

The maximum frequency of the bus is 40 MHz¹⁰. This means that the maximum bandwidth of this bus is $40 \times 5 = 200$ Mbytes/sec. Now, the demand for bandwidth from these two components will be $140 + 80 = 220$ Mbytes/sec

Q2.

10 marks

Assume that the FALCONA is operating at a clock frequency of 1 GHz. Also, assume that the **subi** and the **jnz** instructions take 5 and 6 clock periods, respectively, to execute. Since these two instructions execute 65,535 times each, so you need to compute the execution time of this loop.

Solution:

$$ET = CPI \times IC \times T = CPI \times IC / f$$

CPI = clocks per instruction

IC = instruction count

T = time period of the clock, and

f = frequency of the clock.

Using the assumed values, we get

$$CPI = 5.6$$

$$IC = 65535$$

$$f = 1 \text{ GHz}$$

$$\begin{aligned} ET &= (5+6) \times 65535 / (1 \times 10^9) \\ &= 11 \times 65535 / (1 \times 10^9) \\ &= 720885 / (1 \times 10^9) \\ &= 0.000720885 \text{ sec} \end{aligned}$$