

Computer Organization' 2013

Tutorial # 4

September 20, 2013

- Two microprocessors have 16- and 32-bit wide external data buses. Other features are same and bus cycles are identical.
 - If all instructions and operands are 4 bytes long, by what factor the maximum data transfer rate differ?
 - Repeat above, if half of the instructions and opcodes are two-bytes long.
- For the synchronous read operation, the memory module must place the data on the bus sufficiently ahead of the falling edge of the Read signal to allow for the signal settling. The clock frequency is 20 MHz and Read signal begins to fall in the middle of the second half of T_3 .
 - Determine the length of the memory read cycle.
 - When, at the latest, should memory data be placed on the bus? Allow 10 ns for settling of data lines.
- Assume an instruction set that uses a fixed 16-bit instruction length. Operand specifiers are 6 bits in length. There are 5 two operand instructions and 33 zero operand instructions. What is the maximum number of one-operand instructions that can be encoded using the fixed 16-bit instruction length?
- A given processor has 32 registers, uses 16-bit immediate and has 142 instructions in its ISA. In a given program,
 - 20 % of the instructions take 1 input register and have 1 output register.,
 - 30 % have 2 input registers and 1 output register,
 - 25 % have 1 input register, 1 output register and take an immediate input as well, and the remaining 25 % have one immediate input and 1 output register.
 - For each of the 4 types of instructions , how many bits are required? Assume that the ISA requires that all instructions be a multiple of 8 bits in length.
 - How much less memory does the program take up if variable-length instruction set encoding is used as opposed to fixed-length encoding?
- Specify the register contents and the flag status as the following instructions are executed for 8085 processor:
XRA A
MVI B, FFH
INR B
DCR A
ADD B
SUI 86H

ANA C

RST1

6. A system is designed to monitor the temperature of a furnace. Temperature readings are recorded in 16 bits and stored in memory locations starting at 7060H. The high-order byte is stored first and the low-order byte is stored in the next consecutive memory location. However, the low-order byte of all the temperature readings is constant. Write 8085 ALP to transfer the high-order readings to consecutive memory locations starting at 7080H and discard the low-order bytes. Temperature Readings (H): 6745, 8745, 1F45, 3045, 8045, 7F45.