



KEEPING MOBILE PHONE/SMART WATCH, EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE

Answer ALL Questions

(10 X 10 = 100 Marks)

1. i) Program execution time T is to be examined for a certain high-level language program. The program can be run on a RISC or a CISC computer. Both computers use pipelined instruction execution, but pipelining in the RISC machine is more effective than in the CISC machine. Specifically, the effective value of S in the T expression for the RISC machine is 1.3, but it is only 1.6 for the CISC machine. Both machines have the same clock rate R . What is the largest allowable value for N , the number of instructions executed on the CISC machine, expressed as a percentage of the N value for the RISC machine, if time for execution on the CISC machine is to be longer than on the RISC machine?
ii) Repeat the part (i) if the clock rate, R , for the RISC machine is 20% higher than that of the CISC machine.
2. A two-word instruction is stored in memory at an address designated by the symbol W . The address field of the instruction (stored at $W+1$) is designated by the symbol Y . The operand used during the execution of the instruction is stored at an address symbolized by Z . An index register contains the value X . State how Z is calculated from the other addresses if the addressing mode of the instruction is (a) direct (b) indirect (c) relative (d) indexed.
3. a) Perform the 2's complement subtraction in the 8 bit ALU. Let A and B be the 8 bit signed numbers. Let $A=1101\ 1101$ $B=1100\ 1001$. Perform $A-B$ and also show the status if the carry flag, Negative flag, Overflow flag and Zero Flag. [5]
b) Explain how the character typed in the keyboard is transferred to processor and character from the processor is displayed on the display screen using program controlled I/O method? [5]
4. Implementation of $2M \times 32$ module using $512K \times 8$ RAM chips.

6. a) Consider a direct-mapped cache of size 16KB with block size 256 bytes. The size of main memory of 128 KB. Find the number of bits in tag and tag directory size. [5]

b) Consider a fully associative mapped cache with block size 4KB. The size of main memory is 16GB. Find the number of bits in tag. [5]

6. A multiplier circuit employing Booth algorithm is used to multiply two signed numbers +18 (multiplicand) and -11 (multiplier) expressed in 2's complement binary notation. Show the Booth recording for the multiplier and calculate the product by using Booth algorithm and also draw the block diagram of the Booth's Multiplier.

7. Draw the block diagram of restoring division and explain the algorithm. The dividend 16 is stored in register Q and the divisor 3 in M register. Perform the division using restoring division.

8. With a neat diagram, explain how the concept of operand forwarding is performed in a pipelined processor.

9. Consider the following sequence of instructions:

Sub #50, R0, R1

Div #6, R2, R3

Or #3, R2, R4

Mul R0, R2, R4

In all instructions, the destination operand is given last. Initially, registers R0 and R2 contain 2000 and 50, respectively. These instructions are executed in a computer that has a four-stage pipeline. Assume that the first instruction is fetched in clock cycle 1 and that instruction fetch requires only one clock cycle.

a) With neat diagram, describe the operation being performed by each pipeline stage during each of clock cycles 1 through 4.

b) Give the contents of the interstage buffers, B1, B2 and B3, during clock cycles 2 to 5.

10. Discuss how the multiprocessors systems are interconnected by using Tree Networks and Ring Networks.

bus.
mesh.
toroidal.
hypercubical.
Fat tree.
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