

系所組別： 資訊工程學系

考試科目： 計算機組織與系統

考試日期： 0226 · 節次： 1

請勿在本試題紙上作答，否則不予計分

共八題(3 頁)，請在答案卷作一表格如下，並清楚地填入這些題目的答案，否則不予計分。

題號	答案
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1. [15%] Figure 1 shows the control of the multicycle MIPS processor. There are a number of typos in the plot. Identify and correct the typos.

(背面仍有題目,請繼續作答)

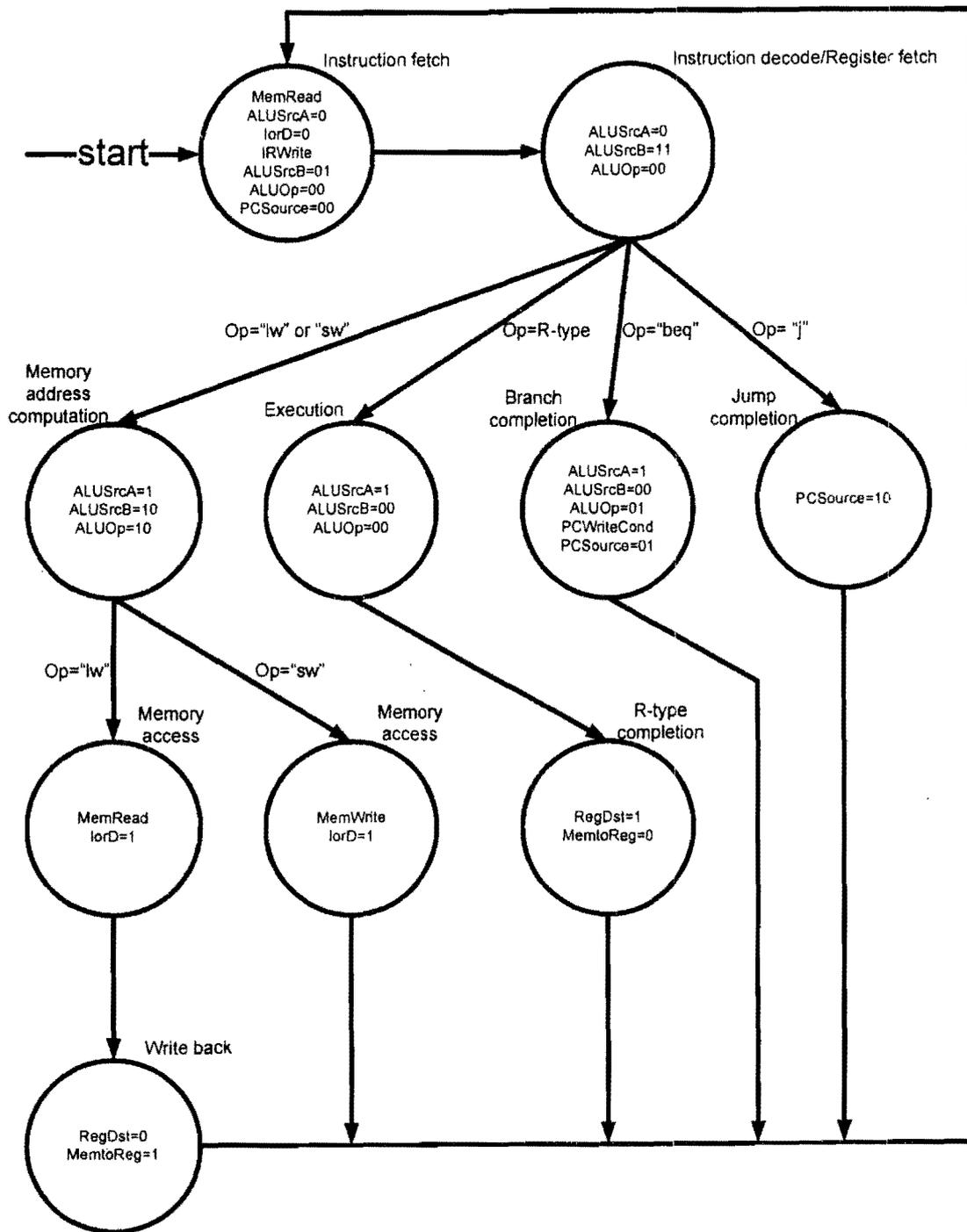


Figure 1: The control of the multicycle processor

2. [10%] Let registers $\$s0$ and $\$s1$ have the binary numbers $11111111111111111111111111111111_{two}$ and $00000000000000000000000000000001_{two}$, respectively. What are the values of registers $\$t0$ and $\$t1$ after executing the two instructions as follows:

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slt    $t0, $s0, $s1
sltu   $t1, $s0, $s1
    
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3. [15%] Define a benchmark to measure the performance of a file system. Justify your benchmark.
4. [10%] Represent an interconnection network as a graph $G = (V, E)$, where V is the set of nodes in the network G and E includes the edges connecting the nodes in V . A path is an acyclic subgraph of G . The length of a path in G is the number of edges on the path. A shortest path between two distinct nodes $u, v \in V$ is a path with a minimum number of edges connecting u and v .
 - (a) Let G be a 16-node hypercube. Detail the topology of G .
 - (b) Consider any two distinct nodes $u, v \in V$. How many shortest paths of length 4 are present in a 16-node hypercube?
5. [15%] Compared to monolithic kernels, which of the following are the advantage(s) of microkernels? Please briefly describe your answer.
 - (a) Higher performance
 - (b) More secure
 - (c) More reliable
6. [15%] Assume we have a demand-paged memory. The page table is held in registers. It takes 10 milliseconds to service a page fault if an empty page is available or the replaced page is not modified, and 20 milliseconds if the replaced page is modified. Memory access time is 100 nanoseconds. Assume that the page to be replaced is modified 80 percent of the time. What is the maximum acceptable page-fault rate for an effective access time of no more than 200 nanoseconds?
7. [10%] Suppose that a machine provides instructions that can access memory locations using the two-level indirect addressing scheme. Assume that all of the pages of a process P are currently non-resident, the first instruction of P is a two-level indirect memory load operation, and the operating system is using a per-process frame allocation technique. In the following cases, what are the maximal numbers of page faults for the execution of the first instruction of P ?
 - (a) P is allocated 20 pages
 - (b) P is allocated 2 pages
8. [10%] What is the main advantage of the variation of linked allocation that uses a FAT (File Allocation Table) to chain together the blocks of a file?