※ 考生請注意：本試題不可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. Briefly describe the following terms: (a) Interleaved memory (5%), (b) Virtualization (5%), (c) Data hazards (5%), (d) Load/store architecture (5%), (e) Petri nets (5%),

2. In a virtual memory system using a demand-paged method, the page table is stored in registers. It is found that 50% of the pages to be replaced are modified, i.e. dirty. If there is no page fault, the memory access time is 10 nanoseconds. To service a page fault, the OS may encounter the following three situations with the required elapsed time:

   1. An empty page is available requiring 50 microseconds;
   2. The replaced page is not dirty requiring 50 microseconds;
   3. The replaced page is dirty requiring 500 microseconds;

   Assuming the page fault rate is 0.00002, or 0.002%. What is the effective access time in nanoseconds? (20%)

3. In a time sharing system, assume the average context switching time between process is t, and the time quantum is q. Discuss the effect of each of the following conditions:
   (a) q close to t. (5%)
   (b) q much greater than t. (5%)
   (c) q almost equals to infinite. (5%)

4. Suppose we have two implementations of the same instruction set architecture. Machine A has a clock cycle time of 1 ns and a CPI of 2.5 for some program, and machine B has a clock cycle time of 2 ns and a CPI of 1.5 for the same program. Which machine is faster for this program, and by how much? (20%)

5. Suppose that the head of a moving-head disk with 200 tracks, numbered 0 to 199, is currently serving a request at track 143 and has just finished a request at track 125. The queue of requests is kept in the FIFO order:
   86, 150, 92, 175, 95, 149, 4
   Compute the amount of head movements to satisfy the above requests for the following algorithms:
   (a) FCFS (5%), (b) SCAN (5%), (c) LOOK (5%), (d) C-SCAN (5%).