Exercise sheet 2

1. (a) A mono-processor has several processes in the ready-queue:
   - one process plays computer music via the sound card;
   - four processes perform a long compilation;
   - one process is an editing process.

   The process playing the music needs the processor 75% of the time for the music to be of high quality. Assume further that the compilation process and the editors access different disks. Describe the effects of Round-Robin, Shortest-Job-First and priority scheduling (with suitably chosen priorities) on the response time of these processes.

   (b) Assume the music playing process requires a response time of 1ms. Can we use virtual memory for the memory assigned to this process?

2. Suppose that a scheduling algorithm favours those processes that have used the least processor time in the recent past. Why will this algorithm favour I/O-bound programs and yet not permanently starve CPU-bound programs?

3. Show that the Shortest-Job-First algorithm minimizes the average waiting time. (Hint: consider the effect on the average waiting time of an exchange of a process with a short and a long burst time).

4. Consider a paging system with the page table stored in memory.

   (a) If a memory reference takes 200 nanoseconds, how long does a paged memory reference takes?

   (b) If we add associative registers, and 75% of all page-table references are found in the associative registers, what is the effective memory reference time? (Assume that finding a page-table entry in the associative registers take zero time, if the entry is there).

5. What is the effect of allowing two entries in a page table to point to the same page frame in memory? Explain how this effect could be used to decrease the amount of time needed to copy a large amount of memory from one place to another. What would be the effect of updating some byte in the one page be on the other page?