1. True/False questions. Give your reasons if it is *false*.

[20%; gain 5 points for each correct answer and drop 1 point for each wrong answer]

(a) The major difference between SRAM and DRAM is that SRAMs can hold data via a static charge, even with power off.

(b) 8 flop-flops are required to construct a decade counter.

(c) In a multiprogramming operating system, the CPU-bound program has higher priority than IO-bound program.

(d) The main function of write through(WT) is to update the main memory and cache memory simultaneously.

2. [20%]

Briefly explain the following terms:

(a) Internal / external fragmentation

(b) Petri nets

(c) System throughput
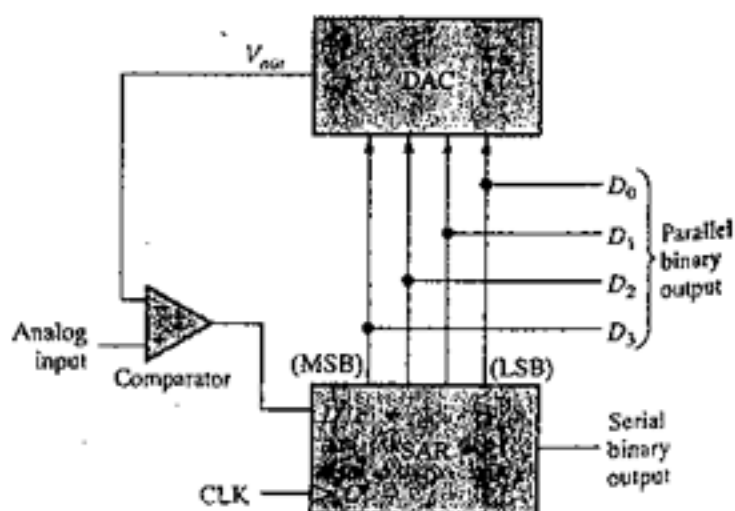
(d) Vector processing

3. Operating Systems [20%]

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

(b) q much greater than t

(c) q almost equals to infinite

4. Logic Design [20%]

In the following block diagram of an interfacing circuit;

(a) What is the SAR?

(b) What is the main purpose of this diagram?

(c) Illustrate the working process in detail.

5. Computer Architecture [20%]

A computer system has a 32 bit virtual address and a 28 bit physical address. The virtual address is divided into three parts. The last 9 bits represent the address within a page. The next 12 bits represent the page number and the remaining (most significant) bits represent the segment number. The machine uses a translation look-aside buffer (TLB).

(a) Compare the "virtual memory" with "cache memory".

(b) What are the virtual memory size, the physical memory size, and the page size for this system?

(c) What are the sizes of the segment table and the page table in bits?

(d) Suggest a suitable size for the TLB.