SINGAPORE POLYTECHNIC
SCHOOL OF ELECTRICAL & ELECTRONIC ENGINEERING
ET0023 OPERATING SYSTEMS

TUTORIAL 5 – Process Management & Scheduling

1. Name 5 situations when the Process Scheduler has to make a scheduling decision.
   Illustrate your answer with using a program that has to read data from the hard disk (a database) and to display the results on the screen, based on a query entered by the user.

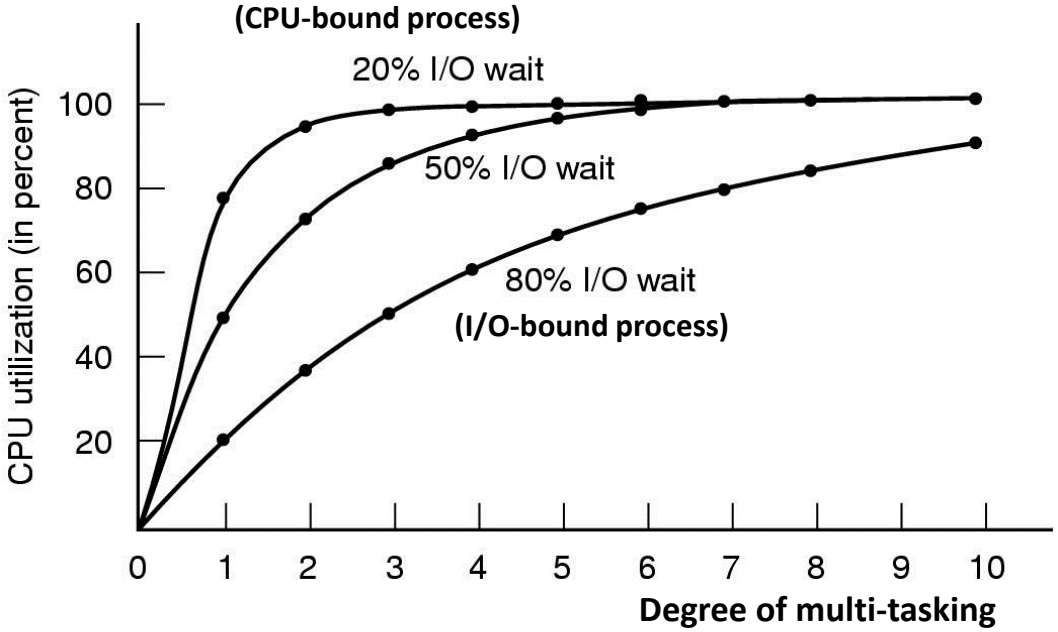
2. Name the 4 ways a process can be made to terminate by the Process Scheduler.
   Use the "man make" command to read about the make program . Answer the following questions:

   a) What is the purpose of the make program?
   b) Name the ways the make program can terminate when run.
   c) Is there any way you can determine how the program terminated?
   d) In Linux, there is a process called the "Zombie" process.
      How is this process created?
      How would you recognize this process?
      How would you remove this process?

3. What is the difference between pre-emptive scheduling algorithms and non-pre-emptive scheduling algorithms?
   Which of them requires the use of a system clock? What is the purpose of the system clock?
   Give two examples of both these algorithms?

4. A process scheduler is usually tuned to suit particular Operating Systems. What are the 5 scheduling criterion that must be considered when deciding which process to run next?
   Using the 5 criterion that you have specified, compare the differences between the selections for a Desktop OS, a Real Time OS and a Batch processing OS.

5. What is a CPU-bound process? How does this differ from an I/O bound process?
If you were tuning the process scheduler, which type of process would you give a higher CPU time slice? Why?



CPU utilization as a function of number of processes in memory

We are now going to compare the execution of 4 jobs. We shall assume that the jobs have, on average, an 80% I/O wait, which is typical of most programs that use I/O.
The arrival times and the time of execution of the jobs are as follows:

Process	Arrival Time	CPU time required
P1	00:00	5
P2	00:10	3
P3	00:20	2
P4	00:24	2

What would be the time taken to complete the 4 jobs if the jobs were submitted to a single process Batch processing unit?

What would be the time taken to complete the 4 jobs if the jobs were submitted to a multitasking system that could handle more than 4 jobs at the same time?

For each of the above cases, determine also, the utilization of the CPU when the processes are running.

You may approximate the processing times for the 80% I/O wait to the following values:

Number of Processes	1	2	3	4
CPU Busy (%)	20	36	48	64