All questions are single answer. Space has been provided after each question for you to state assumptions and/or justify for you answers. This is optional.

1. For each of the following definitions, enter the term (from the list below) that is best fits the definition. Enter your selection in the space provided. Each correct answer is worth 0.5 marks.

   a) A process that is created by another process is called a _____ .

   b) One type of event that can cause a context switch to occur is a _____ .

   c) The process of storing and restoring the state of a CPU is called _____ .

   d) A computer program that runs in the background is sometimes referred to as a _____ .

child process	interrupt vector	process table
context switching	multiprogramming	scheduler
daemon	parent process	sequential execution
fork	process	shell
interrupt	process group	signal
interrupt service routine	process ID (PID)	zombie

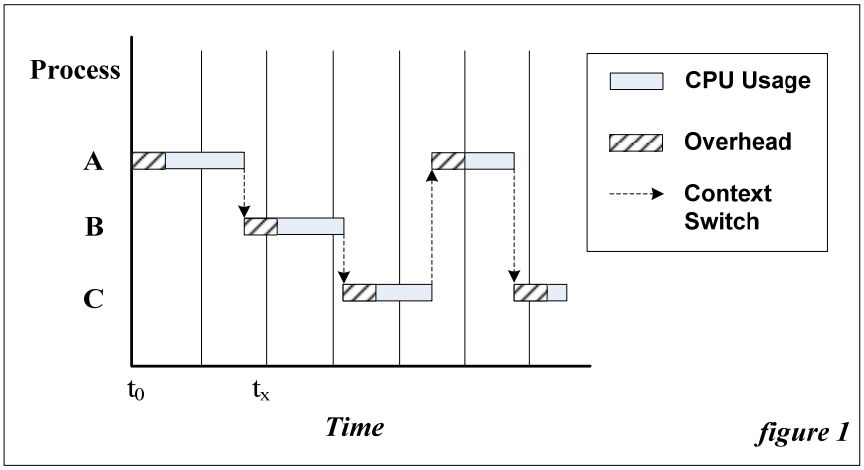

figure 1

2. Assume there are three programs loaded into memory in a single CPU system. All processes are available to begin execution at their program entry point at time t_0. A trace of the processes is illustrated in figure 1.

   Which one of the following statements best explains what is happening at time t_x?

   a) Process A is using the CPU
   b) Process B is using the CPU
   c) Process B is performing IO
   d) The scheduler is using the CPU
   e) The interrupt handler is using the CPU
   f) The system call dispatcher is using the CPU

   Justification (optional): _____

   _____

3. Consider the following scenarios:

   Scenario 1: Two jobs are started simultaneously on a CPU. Each job requires 8 minutes of CPU, and has an IO wait of 75%.

   Scenario 2: Three different jobs are started simultaneously on another CPU. Each of these jobs requires 6 minutes of CPU, and has an IO wait of 50%.

   Assume an optimal situation where IO and CPU overlap are maximized. Which of the scenarios requires the most time to complete

   a) Scenario 1
   b) Scenario 2
   c) Both scenarios require the same amount of time to complete

   Justification (optional): _____

   _____

4. A user types **`cat food`** on a Unix shell command line and presses the Enter key. Which one of the following actions does ***not*** occur during the execution of the **`cat`** command?

   a) A new entry is created in the process table.
   b) The **`exec`** or **`execve`** system call is used to load a program into memory.
   c) The **`fork`** system call is used to create a process.
   d) The shell program will block and wait until the cat command finishes.
   e) The shell will signal the cat process to start executing.

   Justification (optional): _____

   _____

5. The process table is a kernel data structure that is typically pre-allocated in kernel memory during OS initialization.

   a) True
   b) False

   Justification (optional): _____

   _____

6. If a programmer wants to write a program that ignores any SIGQUIT signal it receives, he/she should:

   a) It is not possible to write code to ignore a SIGQUIT signal
   b) Override the kill() function
   c) Register a handler with the signal() system call
   d) Run the process in a different process group
   e) Use the stty command to re-map the keycodes

   Justification (optional): _____

   _____

7. What process state will a process first enter if it is created with the **`fork()`** command?

   a) Blocked
   b) Done
   c) Ready
   d) Running
   e) Start

   Justification (optional): _____

   _____

8. Interrupts are handled by device specific code that is stored in an interrupt vector?

   a) True
   b) False

   Justification (optional): _____

   _____

```
1. while (TRUE) {
2.    type_prompt();
3.    read_command(command, params);
4.    pid = fork();
5.    if (pid < 0) {
6.       printf("Unable to fork\n");
7.       continue;
8.    }
9.    if (pid != 0) {
10.      waitpid(-1, &status, 0);
11.   } else {
12.      execve(command, params, 0);
13.   }
14. }
```

figure 2

9. The outline for a Unix-like command shell is shown in figure 2. The purpose of the statement on line 10 is to:

   a) execute the command that the user entered on the command line
   b) load a program the user specified into the text segment of the current process
   c) signal the parent that execution is complete
   d) wait for the child process to finish executing the command
   e) none of the above

   Justification (optional): _____

   _____