NWEN 301 2021 T2 [20 Marks]
Assignment 1

Due: refer to the dates and times in the submission system

SUBMISSION INSTRUCTIONS:

- Submit using the submission system for NWEN301
- Submit one PDF file only

Question 1 [3 Marks]

List the steps carried out by a typical OS when:

(a) context switching between **processes**
(b) context switching between **user** threads in the **same** processes
(c) context switching between **kernel** threads in the **same** processes

Question 2 [3 Marks]

Using the equation given in class for probabilistically estimating the utilisation of a single CPU under varying degrees of IO-boundness, plot the expected CPU utilisation curve when you have 1 to 8 processes in memory each with a 65% IO time. Ensure you label your axis correctly.

Question 3

(a) **[2 Marks]** Consider the following C program. How many processes are created during execution - include in your count the initial parent process created when running this program from the shell. Feel free to answer this by analysing the code by hand, or running it (hint: you likely will want to augment the output).

```
#include <stdio.h>
#include <unistd.h>

int main(){
  fork();
  fork();
  fork();
  fork();
}
```

(b) **[4 Marks]** Suppose we change our code slightly, as given below. Now how many processes are created?

```
#include <stdio.h>
#include <unistd.h>

int main(){
  fork();
  if(!fork())
     fork();
}
```

Question 4 [3 Marks]

Match the application to the most appropriate computing system:

TV set top box	Many core processor
Location aware map application	Personal computer
Blue tooth traffic monitoring	Mobile phone
Air traffic control	Embedded system
Word processing	Sensor node
Video rendering	Realtime system

Question 5 [5 Marks]

Operating systems can have different design goals depending on the role they are designed for. Consider the goals for a real time system and those for a general purpose computer server used by multiple people. Specifically outline how choosing the next task to run, has fundamentally different requirements in these two systems.