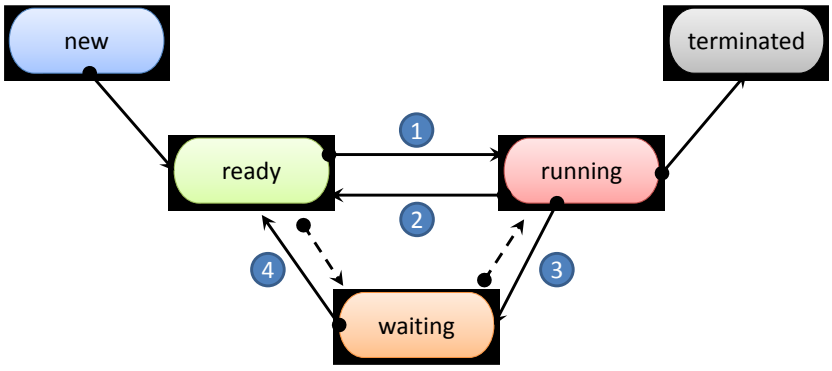
SINGAPORE POLYTECHNIC
SCHOOL OF ELECTRICAL & ELECTRONIC ENGINEERING
ET0023 OPERATING SYSTEMS

TUTORIAL 3 – Programs and Processes

1. A program comprises of lines of instructions, executed sequentially. There are 2 common methods of creating and running a program on a computer:
   a) Compilers
   b) Interpreters
   For each of the methods above, write short notes on their use and characteristics. Give an example of the programming language.
   What is the final outcome of a complied/interpreted program?

2. In most Operating Systems there is a User Mode and a System Mode.
   Highlight the differences between the two modes and explain how a process moves from the System Mode to the User Mode and vice versa in the process of execution.

3. A process in the course of its life changes state. In any one time, a process can be in any of the following states: New, Ready, Running, Waiting and Terminated. A process can only be in the New and Terminated states at the beginning and end of its life, however in the following states: Ready, Running and Waiting, theoretically with these 3 states there can be six transitions (shown with arrows). However, only four transitions (1,2,3 and 4) are shown in the diagram (the missing ones are in dashes).
   Explain when the transitions (1,2,3,4) occur and state whether there any circumstances in which either or both of the missing transitions might occur?



4. Using short notes explain how time-sharing/multi-tasking is achieved with a single CPU. Explain the difference between cooperative and pre-emptive multi-tasking. Give one example, each, of an operating system which uses the processing technique.

5. For this question, you will need to try this on your Linux System:
   i) Write a simple "Hello world" using cpp, name this program helloworld.cpp. How would you execute this program using Linux?
   ii) Modify your program to include an infinite loop printing out "Hello world" continuously. Compile and execute this program.
   iii) Which command would you use to locate the PID of this program?
   iv) Which command would you use to determine the priority, cpu and memory usage of this program?
   v) Which system command(s) would you use to terminate this program?