CSE4300 Operating Systems (Spring 2019)

Midterm Exam 1

Student Name: _____

Student NetID: _____

Question	Score
1	
2	
3	
4	
5	
Total	

Question 1.1: What are the four components of a computer system? (5 points)

Question 1.2: When we say an OS is a resource allocator, what are its two key functions? (5 points)

Question 1.3: What is caching mechanism? Why it is challenging to design the caching mechanism in multiprocessor environment? (10 points)

Question 2.1: Please describe how system call is implemented in general-purpose OS? (10 points)

Question 2.2: What is the difference between policy and mechanism in OS? (5 points)

Question 2.3: Please describe the differences between the traditional UNIX OS structure and the Microkernel OS structure. (5 points)

Question 3: Using the following program, identify the values of pid at lines A, B, C, and D. (Assume that the actual pids of the parent and child are 2601 and 2605, respectively.) (20 points)

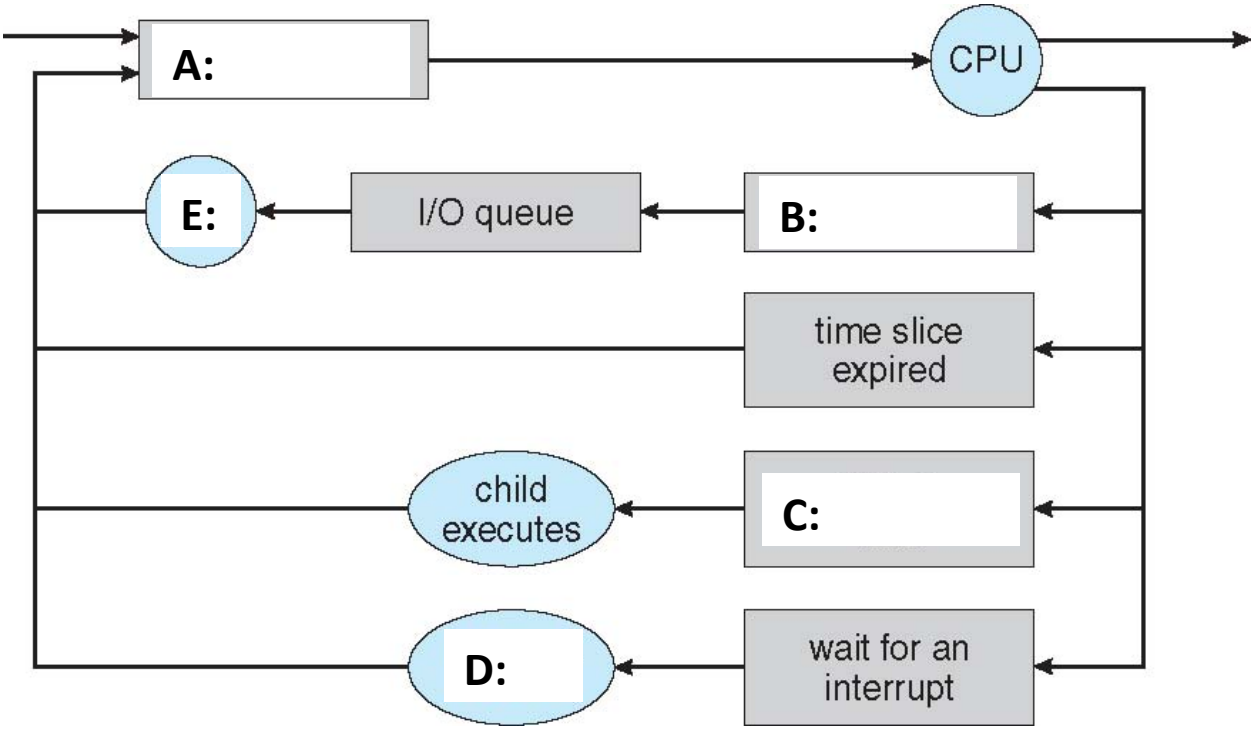
```
#include <sys/types.h>
#include <stdio.h>
#include <unistd.h>

int main()
{
pid t pid, pid1;

   /* fork a child process */
   pid = fork();

   if (pid < 0) { /* error occurred */
          fprintf(stderr, "Fork Failed");
          return 1;
   }
   else if (pid == 0) { /* child process */
          pid1 = getpid();
          printf("child: pid = %d",pid);          /* A */
          printf("child: pid1 = %d",pid1);        /* B */
   }
   else { /* parent process */
          pid1 = getpid();
          printf("parent: pid = %d",pid);         /* C */
          printf("parent: pid1 = %d",pid1);       /* D */
          wait(NULL);
   }
   return 0;
}
```

Question 4.1: Please fill in the missing blocks (A, B, C, D, E) in the following queueing diagram. (15 points)



Question 4.2: What is the difference between short-term scheduler and long-term scheduler? (5 points)

Question 5.1: What are the two models of interprocess communication (IPC)? (5 points)

Question 5.2: How does the signal() operation associated with monitors differ from the corresponding operation defined for semaphores? (5 points)

Question 5.3: Discuss the tradeoff between fairness and throughput of operations in the readers–writers problem. Propose a method for solving the readers–writers problem without causing starvation. (10 points)