

Problem Session 8: Processes and Scheduling

SOLUTION

Wednesday, March 31, 2021

1. How many lines of output does the following function print? Give your answer as a function of n .

```
void foo(unsigned n){
    for(unsigned i = 0; i < n; i++){
        fork();
    }
    printf("hello\n");
}
```

Solution: 2^n

Note that `fork` create a new process with the same code and the same state as the parent process, so each iteration through the loop the total number of processes doubles. At the end of the function, each process prints one line, so the total number of lines printed is equal to the total number of processes (2^n).

2. Consider the following program:

```
void f(){
    printf("2");
}

int main(){
    int check = 0;

    if(fork() == 0){
        check = 1;
    }

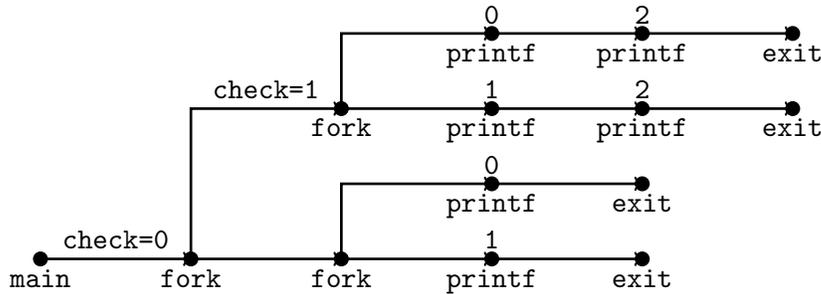
    if(fork() == 0){
        printf("0");
    } else {
        printf("1");
    }

    if(check){
        f();
    }
    exit(0);
}
```

Which of the following outputs are possible:

- (a) 112002
- (b) 211020
- (c) 102120
- (d) 122001
- (e) 100212

Solution: (a), (c), and (e) are possible. (b) and (d) are not. To see this, draw the process graph:

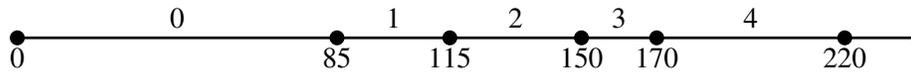


3. Given the following jobs, compute the latency and response time for each job, along with the average response time, for FIFO, STCF, and RR scheduling algorithms. Assume a time slice of 10 for RR.

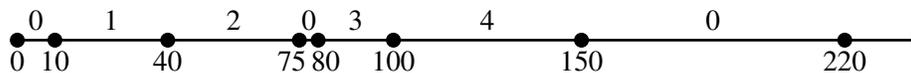
Job	Length	Arrival Time	FIFO		STCF		RR	
			Latency	Response	Latency	Response	Latency	Response
0	85	0	85	0	220	0	220	0
1	30	10	105	75	30	0	70	0
2	35	15	135	100	60	25	110	5
3	20	80	90	70	20	0	55	10
4	50	85	135	85	65	15	120	15
Average:			110	66	79	8	115	6

Solution: See table above. To see this, complete the timeline schedule for this set of jobs for each of the scheduling algorithms as follows:

First in, First out (FIFO):



Shortest Time-to-Completion First (STCF):



Round Robin (RR):

