

## Computer Systems Coursework, Part2

1. Consider a file server where it takes 15 msec to get a request for work, dispatch it, and do the necessary processing, assuming that the data needed are in the cache. If a disk operation is needed, as is the case in one third of the time, an additional 75 msec is required, during which time the thread sleeps.
  - (a) How many request/sec can the server handle if it is single threaded?  
[10 marks]
  - (b) If it is multithreaded (one thread popping up at each request)?  
[5 marks]

Subtotal: [15 marks]
2. Five jobs A through E arrive at a multiprogrammed computer center at almost the same time. They have estimated running times of 10, 6, 2, 4 and 8 minutes, respectively. Their fixed priorities are 3, 5, 2, 1, and 4, respectively. For each of the following scheduling algorithms, determine the average turnaround time.
  - (a) Round robin (choose a *realistic* quantum that would allow a short response time for potential user requests) [5 marks]
  - (b) Priority scheduling (5 being the highest priority) [4 marks]
  - (c) First-come-first-served (in order A, ..., E) [3 marks]
  - (d) Shortest process next [3 marks]

You can ignore process switching overhead and assume that all jobs are completely CPU-bound. Subtotal: [15 marks]

3. Suppose that there are two types of philosophers. A “righty” always picks up his right fork first:

```
begin
  repeat
    think;
    wait ( fork[ (i+1) mod 5] );
    wait ( fork[i] );
    eat;
    signal ( fork[i] );
    signal ( fork[ (i+1) mod 5] );
  forever
end;
```

while a “lefty” always picks up his left fork first:

```
begin
  repeat
    think;
    wait ( fork[i] );
    wait ( fork[ (i+1) mod 5] );
    eat;
    signal ( fork[ (i+1) mod 5] );
    signal ( fork[i] );
  forever
end;
```

Assume that there is at least one righty and one lefty at the round table and that the scheduling is fair. Determine whether

- (a) deadlock [12 marks]
- (b) starvation [8 marks]

are possible. [Hint: First find out whether a philosopher can pick up at least one fork.] Subtotal: [20 marks]

4. A UNIX file system has 1-KB blocks and 4-byte disk addresses. What is the maximum file size if i-nodes contain 10 direct entries, and one single, double, and triple indirect entry each. (The blocksize of the data blocks referenced by the i-node is the same as the file system blocksize.) [15 marks]