COMP SCI/SFWR ENG 4/6E03 — Assignment 3

1. A computer system has one CPU and two disks. After monitoring the system for two hours, the following observations were made. The utilization of the CPU was 43 percent and the utilization of the first disk was 66 percent. Each transaction to the system makes 5 I/O requests to the first disk and 6 to the second disk. The average processing time (per request) at the two disks are both 20 msec.

   (a) What was the throughput of the system (in transactions per second)?

   (b) What was the utilization of the second disk?

   (c) What is the total processing demand (in milliseconds per transaction) at the CPU?

2. A server system consists of three resources. Each user request has resource demands as follows: the processing times at resources A, B and C are 20, 30 and 15 msec, respectively. The average number of visits to A, B and C are 5, 4 and 10, respectively.
   (a) You are given the following three upgrade options:

   (i) Reduce the average number of visits to resource C to 7.

   (ii) Reduce the average processing time at resource B to 25 msec.

   (iii) Reduce the average processing time at resource C to 10 msec.

   If the design goal is to maximize the number of users that can be supported, which option would you choose?
   (b) If the average number of jobs at resource A is 2 and the average waiting time (from arrival to departure at resource A) is 50 msec, what is the throughput of the system (in user requests completed per second)?

3. (a) Database transactions perform an average of 4.5 disk operations on a database server with a single disk. The database server was monitored during one hour and during this period, 7,200 transactions were executed. What is the throughput of the disk (in transactions per second)? If each disk operation takes 20 msec on average, what is the disk utilization?

   (b) What is the average processing time (per transaction) for the disk in (a)?

   (c) A corporate portal provides Web services to the company's employees. On average, 500 employees are online requesting Web services from the portal. An analysis of the portal's log reveals that 6,480 requests are processed per hour on average. The average response time was measured as 5 seconds. What is the average think time of an employee?

4. Consider a system with 50 users, and a server consisting of a CPU and three disks. The average response time perceived by a user is 10 seconds. The throughput of the system is 1.5 user requests per second. It is also known that each user request requires an average of 0.52 seconds of CPU time.

(a) What is the average think time of a user?

(b) What is the CPU utilization?

(c) On average, how many requests is the server processing?