2000 Paper 9 Question 7

Computer System Modelling

A database system has a central processor and three (different) discs.

Measurements are taken for 1000 transactions on a lightly loaded system and the following observations are made.

- The CPU scheduler initiated or resumed transaction processing 10,000 times. The total CPU usage was 25 seconds.

- Disc 1 made 5000 transfers with an average transfer time of 10 ms.

- Disc 2 made 2000 transfers with an average transfer time of 50 ms.

- Disc 3 made 2000 transfers with an average transfer time of 20 ms.

Derive the visit counts, service times and transaction service demands. What is the bottleneck device? What is the maximum throughput of the system measured in transactions per second? [6 marks]

Describe *two* balanced systems which bound the throughput of the system. What is the maximum throughput of these systems? [7 marks]

Recall that the throughput of a balanced system with K devices, N customers and service demand D per device is

$$X(N) = \frac{N}{(N + K - 1)} \times \frac{1}{D}$$

How many transactions do you expect to be in the system with a throughput of 7 transactions per second? [7 marks]