COURSE CODE: 11M1WCI432   MAX. MARKS:35

COURSE NAME: Performance Evaluation of Networks

COURSE CREDITS: 3   MAX. TIME: 2 Hrs

Note: All questions are compulsory and carrying equal marks. Carrying of mobile phone during examinations will be treated as case of unfair means.

Que.1: During a 1-hour observation interval, the name server of a distributed system received 10,800 requests. The mean response time of these requests was observed to be one-third of a second. What is the mean number of queries in the server? What assumptions have you made about the system? Would the mean number of queries be different if the service time was not exponentially distributed?

Que.2: An M/M/m/B/K queue with B buffers and finite population of size K can be modeled as a birth-death process using the following arrival and service rates:

$$\lambda_n = (K-n)\lambda, \qquad n = 0,1,2,...,B-1$$

$$\mu_n = \begin{cases} n\mu, & n = 1,2,...,m-1 \\ m\mu, & n = m,m+1,...,B \end{cases}$$

Derive an expression for the probability p_n of n jobs in the system, average throughput, and average response time of the system.

Que.3: The transactions arrive at a rate of 0.8 transactions per second, use 1 second of CPU time, make 20 I/O's to disk A and 4 I/O's to disk B. Thus, the total number of visits to the CPU is 25. The disk service times are 30 and 25 milliseconds, respectively. Determine the average number of transactions in the system and the average response time.

Que.4: In a timesharing system, accounting log data produced the following profile for user programs. Each program requires 5 seconds of CPU time and makes 80 I/O requests to disk A and 100 I/O requests to disk B. The average think time of the users was 18 seconds. From the device specifications, it was determined that disk A takes 50 milliseconds to satisfy an I/O request and disk B takes 30 milliseconds per request. With 17 active terminals, disk A throughput was observed to be 15.70 I/O requests per second. Find the system throughput and device utilizations.

Que.5: Consider a timesharing system consists of a central processor, two disks labeled A and B, and three terminals. It can be represented by the queuing network of Central server model. An average user makes 13 I/O requests to disk A and 6 I/O requests to disk B. The service times per visit to the CPU, disk A, and disk B are 39, 180, and 260 milliseconds, respectively. The users have an average think time of 4.68 seconds. Compute the device response time and system response time.

Que.6: Consider a batch system with two disks. Each job makes 20 visits to disk B and 4 visits to disk A. The service times per visit to the CPU, disk B, and disk A are 40, 30, and 25 milliseconds. The degree of multiprogramming is 3. Determine the distribution of the CPU queue length. Also, find the system throughput varying the degree of multiprogramming from 1 to 3.

Que.7: Explain the following tests-

    a. Likelihood Ratio Test
    b. Goodness of Fit Test
    c. Robust Test
    d. F-test