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12SCS/SCE14

First Semester M.Tech. Degree Examination, February 2013
Computer Systems Performance Analysis

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions.***

1 a. List and explain atleast 10 common mistakes which are observed frequently in performance equation projects. **(08 Marks)**

b. What are the different evaluation techniques? Explain in detail the various considerations which help in deciding the technique to be used. **(07 Marks)**

c. Briefly explain the various commonly used performance metrics. **(05 Marks)**

2 a. Briefly explain the following bench marks
i) Sieve ii) Ackermann's function. **(06 Marks)**

b. Briefly explain the following with reference to work load selection.
i) Level of detail ii) Representativeness iii) Timeliness. **(10 Marks)**

c. Consider a work load with five components and two parameters. The CPU time and the number of disk I/Os were measured for five programs. The parameter values after scaling are shown in the table given below

Program	CPU time	Disk I/O
A	3	6
B	2	1
C	2	5
D	4	2
E	1	6

Carryout clustering analysis using minimum spanning tree method. **(04 Marks)**

3 a. Explain the following monitor – related terms which are frequently used.
i) Event ii) Trace iii) Overhead iv) Domain
v) Input rate vi) Resolution vii) Input width. **(07 Marks)**

b. With a neat diagram, explain layered view of a distributed system monitor. **(08 Marks)**

c. Explain some of the reasons for monitoring the execution of a program. **(05 Marks)**

4 a. With a neat diagram, briefly explain the steps in capacity planning and management. **(06 Marks)**

b. Explain the various problems in capacity planning. **(10 Marks)**

c. Briefly explain load drivers. **(04 Marks)**

5 a. With usual notations and necessary details, derive the following for a 2^2 design.
$SST = 4q_A^2 + 4q_B^2 + 4q_{AB}^2$. **(10 Marks)**

b. Analyze the 2^3 design given below and interpret the result.

	A_1		A_2	
	C_1	C_2	C_1	C_2
B_1	8	53	17	69
B_2	14	57	42	78

(10 Marks)

6 a. With all necessary details, establish that the steady state probability P_n of a birth – death process to be in state n is given by

$$P_n = \frac{\lambda_0\lambda_1\lambda_2 ----\lambda_{n-1}}{\mu_1\mu_2\mu_3 ----\mu_n} P_0$$

where P_0 denotes the probability of being in state 0. **(10 Marks)**

b. Consider a queuing network model in which each user makes 12 I/O requests to disk A and 9 I/O requests to disk B. The service times per visit to disk A and disk B are 750 and 600 milliseconds respectively. Each request takes 4 seconds of CPU time and the user think time is 6 seconds. Analyze this system using mean value analysis (MVA). Carry out the iterations for N=1 and N =2. **(10 Marks)**

7 a. If D_{max} denotes the demand of bottleneck device, N denotes number of users and Z denotes think time, then establish the following :

$$X(N) \le \min\left\{\frac{1}{D_{max}}, \frac{N}{D+Z}\right\}$$

$$R(N) \ge \max\{D, ND_{max} - Z\}$$

Here D denotes the sum of total service demands on all devices. **(06 Marks)**

b. State and prove Little's law. **(04 Marks)**

c. Consider a system which consists of a processor and two disks. The service times are 60 milliseconds per visit to CPU 130 milliseconds per visit to disk A and 100 milliseconds per visit to disk B. Each job makes 12 I/O requests to disk A and 10 I/O requests to disk B. assuming there are 3 jobs, compute state probabilities. Also compute G(N) using direct method and convolution algorithm. Compare your answers. Take $\alpha = \frac{1}{D_{CPU}}$. **(10 Marks)**

8 Write short notes on the following :

a. Instruction mixes and kernels

b. Markov models

c. Accounting logs

d. Limitations of queuing theory. **(20 Marks)**

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