**Tutorial 8: System Management**

Q1. (a) Briefly discuss the issues to be considered in the process of *Memory Management*, *Processor Management*, *Device Management* and *File Management* respectively.

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| **Memory Management**   * If increase memory or change to another memory allocation scheme must consider actual operating environment in which system resides. * Trade-off between memory use & CPU overhead.   **Processor Management**   * Trade-off: better use of CPU versus increased overhead, slower response time, & decreased throughput.   **Device Management**   * To improve I/O device utilization through blocking, buffering and/or rescheduling requests * Trade-offs: each of these options also increases CPU overhead & uses additional memory space.   **File Management**   * Secondary storage allocation schemes help user organize and access files on system. * Different schemes offer different flexibility, but trade-off for increased file flexibility is increased CPU overhead. |

(b) Suggest **THREE (3)** methods to enhance the utilization of I/O devices.

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| **Methods**   * + 1. Blocking (grouping of data into block)   Blocking reduces number of I/O requests but it increases CPU overhead in blocking and deblocking the records.   * + 1. Buffering   Buffer (temporarily storage) between devices helps the CPU to match I/O devices of slower speed (synchronization). But buffering consumes memory spaces.   * + 1. Rescheduling Requests   Requests rescheduling improves I/O times but it causes overhead in request reordering. |

Q2. (a) System management refers to the management of computing infrastructure. It includes an asset tracking, software versioning, performance measurement, availability monitoring, data backup, capacity planning, and disaster recovery.

Explain **FIVE (5)** system performance measures that most designers and analysts rely upon.

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| **Tools**   * Throughput. * Capacity. * Response time. * Turnaround time. * Resource utilization. * Availability. * Reliability. |

(b) Calculate the availability of a magnetic tape cartridge with an MTBF of 80 hours and an MTTR of 3 days.

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| Availability (A) = MTBF   MTBF + MTTR  = 80  80 + (3 x 24)  = **0.5263**  We may conclude that the magnetic tape cartridge will be available for 5263 hours out of every 10,000 hours or 4737 hours failures out of 10,000 hours. |

Q3. (a) Feedback loop monitoring mechanism is used to prevent processor from spending more time doing overhead than executing jobs. In your opinion, why positive feedback loop is more difficult to implement when compare with negative feedback loop.

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| **Reasons**   * When more jobs entered to the system, the amount of main memory allocated to each job decreases. (Decrease in processing speed) * If too many new jobs are allowed to enter the job stream, the result can be an increase in page faults. (May cause CPU utilization to deteriorate) * If the OS is poorly designed, positive feedback loop can put the system in an unstable mode of operation. |

(b) Differentiate negative feedback loop and positive feedback loop. Support your answer with illustration.

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| C:\Documents and Settings\User\My Documents\My Scans\2011-08 (Aug)\scan0016.jpg**Negative feedback loop**   * Monitor the system and when it becomes too congested, signals the Job Scheduler to slow down arrival rate of processes (stop new job from entering the system).   **Positive feedback loop**   * Monitor the system and when system becomes underutilized, causes arrival rate to increase (bring in more new job).   C:\Documents and Settings\User\My Documents\My Scans\2011-08 (Aug)\scan0018.jpg |

Q4. Consider a demand-paging system with the following time-measured utilizations:

CPU utilization 20%

Paging disk 97.7%

Other I/O devices 5%

Which (if any) of the following will (probably) improve CPU utilization? Explain your answer.

a. Install a faster CPU.

b. Install a bigger paging disk.

c. Increase the degree of multiprogramming.

d. Decrease the degree of multiprogramming.

e. Install more main memory.

f. Install a faster hard disk or multiple controllers with multiple hard disks.

g. Increasing the page size.

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| Clearly the system is thrashing. The system obviously is spending most of its time paging, indicating over-allocation of memory. If the level of multiprogramming is reduced resident processes would page fault less frequently and the CPU utilization would improve. Another way to improve performance would be to get more physical memory or a faster paging drum.  a. Install a faster CPU—No.  b. Install a bigger paging disk—No.  c. Increase the degree of multiprogramming—No.  d. Decrease the degree of multiprogramming—Yes.  e. Install more main memory—Likely to improve CPU utilization as more pages can remain resident and not require paging to or from the disks.  f. Install a faster hard disk or multiple controllers with multiple hard disks—Also an improvement, for as the disk bottleneck is removed by faster response and more throughput to the disks, the CPU will get more data more quickly.  g. Increasing the degree of multiprogramming (c) and increasing the page size (g) would only make things worse, since each process would have fewer frames available and the page fault rate would increase. |

Q5. (a) Suggest **TWO (2)** techniques which are appropriate for individual user to protect his / her computer. Justify your answer.

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| **Protection techniques**   * Passwords -- unusual combination of characters & numbers that is memorable changed often. * Making backups& performing other archiving techniques. * Frequent password changes. * Reliable backup procedures. * Compliance with software licenses. * Network safeguards. * Guidelines for monitoring network activity. * Rules for terminal access. |

(b) With respect to security protection, evaluate on the areas of *ease of protection*, *relative risk* and *vulnerabilities* for each of the following computer configurations:

* Single computer (without e-mail or Internet)
* LAN connected (without Internet)
* LAN connected (with Internet)

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| **Configuration** | **Ease of Protection** | **Relative Risk** | **Vulnerabilities** |
| single computer (without e-mail or Internet) | high | low | Compromised passwords, viruses |
| LAN connected  (without Internet) | medium | medium | Sniffers, spoofing, compromised passwords, viruses |
| LAN connected  (with Internet) | low | high | E-mail, Web servers, Sniffers, spoofing, compromised passwords, viruses |