ADCA / MCA (III Year)

Term-End Examination

December, 2006

CS-13 : OPERATING SYSTEMS

Time : 3 hours   *Maximum Marks : 75*

Note : Question number 1 is **compulsory**. Answer any **three** questions from the rest.

1. (a) What is spooling ? Explain how this concept affects the system performance. **4**

   (b) List and explain at least four criteria that the schedulers use for optimization and performance improvement. Discuss the role of schedulers in implementation of multiple-level queues (MLQ) scheduling. **7**

   (c) For the following page reference string

   0, 9, 0, 1, 8, 1, 8, 7, 8, 7, 1, 2, 8, 2, 7, 8, 2, 3, 8, 3

   determine the number of page faults for the given page replacement algorithms with 3 frames :

   (i) FIFO

   (ii) LRU

   (iii) OPT (optimal) **6**

(d) Classify all types of multiprocessor systems. Also explain why shared bus multiprocessors are generally regarded as having limited scalability. 7

(e) What is the importance of ordering of events in distributed systems ? Is ordering of events important in centralized systems as well ? Explain. 6

2. (a) Consider the following three processes with the length of the CPU-burst time given in milliseconds :

Process	Burst Time
P_1	8
P_2	1
P_3	2

(i) Draw Gantt charts showing the execution of these processes for the following scheduling policies :

(1) FCFS

(2) SJF

(3) Round-Robin (quantum = 1)

(ii) Assuming that processes arrived in the order P_1, P_2, P_3 at time 0, determine waiting time and turnaround time of each process for the scheduling algorithms above. 6

(b) Define program relocatability. Compare and contrast static and dynamic relocation. With the help of diagram, illustrate dynamic relocation. Describe the role of memory compaction in dynamic partitioning. 9

3. (a) Define the terms mutual exclusion, critical section and semaphores. Write the producer – consumer code using semaphores. *8*

   (b) Differentiate reusable and consumable resources with example. Write deadlock detection algorithm and mention its time complexity. *7*

4. (a) With example for each, describe the first-fit, best-fit and worst-fit strategies for determining free holes for allocation. Discuss the external and internal fragmentation problems in multiple partition allocation. *5*

   (b) With the help of a diagram, describe paging scheme. Describe how translation look-aside buffer helps in improvement of this strategy. *5*

   (c) In a paging system, if memory access time is 200 ns, time to search TLB is 20 ns and hit ratio is 90%, calculate the effective memory access time. Give relationship between page size, no. of page frames and memory capacity. *5*

5. (a) What do you mean by device independence and asynchronous I/O ? Explain disk caching with its advantages. *6*

   (b) Explain Access-Matrix Model of protection. Also discuss, how Bell-LaPadula flow control model is based on it. *9*