B.Tech 4th Sem (IT) May 2018
Operating System IT-212

Note: Attempt any five questions selecting at least one question from each section. M.M=50

Section A

Q1. a) Distinguish between multiprogramming and multiprocessing system. What were the key motivations for the development of each? (5)

b) What information about a process need to be saved, updated when context switching takes place. (5)

Q2. a) For each algorithm: SRT & Round robin (Time Quantum=4ms), calculate the average waiting time for the instance of the problem given below: (5)

Arrival time	0	3	5	9	10	12	14	16	17	19
CPU cycles	6	2	1	7	5	3	4	5	7	2

b) What advantage is there in having different time quantum sizes on different levels of multilevel queue scheduling? (5)

Section B

Q3. a) What are the three requirements of any solution to the critical section problem? Why are these requirements needed? (4)

b) What is a deadlock? Consider the deadlock situation that could occur in the dining philosopher's problem when the philosophers obtain the chopsticks one at a time. Discuss how the four necessary conditions for deadlock indeed hold in this setting. Give a solution to the problem using Monitors. (6)

Q4. a) Consider the following snapshot of a system:

	Allocation	***Max***	***Available***
	A B C D	*A B C D*	*A B C D*
P0	2 0 0 1	4 2 1 2	3 3 2 1
P1	3 1 2 1	5 2 5 2	
P2	2 1 0 3	2 3 1 6	
P3	1 3 1 2	1 4 2 4	
P4	1 4 3 2	3 6 6 5	

Answer the following questions using the banker's algorithm:

i. Illustrate that the system is in a safe state by demonstrating an order in which the processes may complete.

ii. If a request from process *P1* arrives for (1, 1, 0, 0), can the request be granted immediately?

iii. If a request from process *P4* arrives for (0, 0, 2, 0), can the request be granted immediately?

b) Why it is difficult to choose which process to flush in deadlock recovery. (6) (4)

Section C

Q5 a) How does fragmentation manifests itself in each of the following types of virtual storage systems: Segmentation, Paging, combines segmentation/paging. (5)

b) Assume that we have a demand-paged memory. The page table is held in registers. It takes 8milliseconds to service a page fault if an empty frame is available or if the replaced page is

not modified and 20 milliseconds if the replaced page is modified. Memory-access time is 100 nanoseconds. Assume that the page to be replaced is modified 70 percent of the time. What is the maximum acceptable page-fault rate for an effective access time of no more than 200 nanoseconds? (5)

Q6.a) Which file allocation scheme would work best for a file system implemented on a device that can only be accessed sequentially, a tape derives, for instance. Explain it? (5)

b) Explain the linked list method of free space management? What are its pros and cons? How this can be improved further? (5)

Section D

Q7 a) Assume that a main memory with only 4 pages, each of 16 bytes, is initially empty. The CPU generates the sequence of virtual addresses: 0, 4, 8, 20, 24, 36, 44, 12, 68, 72, 80, 84, 28, 32, 88, 92 and uses the Least Recently Used (LRU) page replacement policy. How many page faults does this sequence cause? What are the pages numbers of the pages present in the main memory at the end of the sequence? (4)

b) Consider the parameter Δ used to define the working-set window in the working-set model. When Δ is set to a small value, what is the effect on the page-fault frequency and the number of active (non-suspended) processes currently executing in the system? What is the effect when Δ is set to a very high value? (6)

Q8. a) Consider the following sequence of disk tracks requests 27,129,110,186,147,41,10,64,120. Assume that initially the head is at track 30 and is moving in the direction of decreasing track numbers. Compute the no. of tracks the head traverses using SSTF and elevator algorithms. (6)

b) What are the advantages of multi threading with respect to improving the performance of single threaded solution. (4)