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END TERM EXAMINATION

SIXTH SEMESTER [B.TECH] MAY - JUNE 2019

Paper Code: IT-310 **Subject: Operating Systems Design Concept**

Time: 3 Hours **Maximum Marks: 75**

Note: Attempt any five questions including Q no.1 which is compulsory.

Q1 (a) Write four necessary and sufficient conditions of a deadlock to occur in a system. What is the minimum number of processes that can be in deadlock state at a time? **(5)**

(b) In a priority driven CPU scheduling, priority of a process is proportional to its waiting time in the ready queue. Suggest an equivalent processor scheduling policy which will be equivalent to the given priority scheduling. Justify your answer. **(5)**

(c) What do you mean by internal and external fragmentation of main memory? Does segmentation with paging removes all types of fragmentation? **(5)**

(d) Design a producer consumer problem using semaphore which may lead to deadlock state. **(5)**

(e) Write various types of file access methods. **(5)**

Q2 (a) Differentiate parallel system with distributed system. Explain the concept of batch processing system and how is it helpful in maximizing resource utilization? **(6)**

(b) In a dynamic priority driven CPU scheduling algorithm, priority of a process keeps on changing with time. If the priority of waiting process changes at the rate of x whereas priority of executing process changes at the rate of y, how will this algorithm work when i) $y > x > 0$ and ii) $x < y < 0$, assuming process has zero priority when it enters in the ready queue. Justify your answer. **(6.5)**

Q3 (a) Explain the concept of context switching with suitable example. What is a process control block of a process and how is it useful in processor scheduling? **(6)**

(b) What do you mean by race condition? Explain with suitable example. Further, write three conditions that need to be satisfied for an ideal solution to the critical section problem. **(6.5)**

Q4 Consider a system with following current resource allocation state. There are five processes (P0, P1, P2, P3, P4) and three resources (A, B, C). For each process, the current allocation and maximum requirement of resources is given by the ALLOCATION and MAX matrices. There are maximum 10, 6 and 7 instances of resources A, B and C respectively.

	ALLOCATION			MAX		
	A	B	C	A	B	C
P0	1	1	2	4	3	3
P1	2	1	2	3	2	1
P2	4	0	1	9	0	2
P3	0	2	0	7	5	3
P4	1	1	2	11	2	3

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(a) Determine whether the system is in safe state? **(6.5)**

(b) If process P0 generates a request (3, 3, 1) for the resources of type A, B and C respectively, whether that request will be granted? Explain with reason. **(6)**

Q5 (a) Explain the paging concept of memory binding. If the size of virtual address is 16 bits length and that of physical address is 13 bits, assuming the page size of 1 Kbytes, for the given page table, generate physical addresses of the following virtual addresses of a process using all 13 bits. **(6.25)**

Virtual Addresses – (3, 28), (5, 1000) and (6, 1125)

Page Table

2
6
1
7
0
3

(b) How do page size and preparing affect the performance of demand paging? Explain global and local frame allocation methods. **(6.25)**

Q6 What do you mean by page fault and how is it handled in the system? Explain Optimal, LRU and second chance LRU approximation methods of page replacement with suitable examples. **(12.5)**

Q7 (a) What is thrashing? Suggest its solution using working set model based approach. **(6)**

(b) Explain tree and graph based directory structures with suitable example. How does the performance of a directory structure is measured? **(6.5)**

Q8 (a) Explain contiguous and indexed file allocation methods. **(6)**

(b) What are SSTF and SCAN disk scheduling algorithms. Explain with suitable examples. **(6.5)**

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