

**B3.4-R4 : OPERATING SYSTEMS****NOTE :**

1. Answer question 1 and any FOUR from questions 2 to 7.
2. Parts of the same question should be answered together and in the same sequence.

**Time : 3 Hours****Total Marks : 100**

1. (a) How does the OS act as a resource manager ? What is the concept of extended machine in view of the OS ?  
(b) Suppose there are two users, X and Y each having their own directories */usr/X/* and */usr/Y/*. How will you link one user with the other user ?  
(c) How does time quantum affect CPU efficiency in view of scheduling strategy ?  
(d) In distributed systems, name servers are responsible for name resolution. Justify. To share resources among users need for protection. What is the spectrum where the OS offers protection ?  
(e) There is a relation between memory size and Page FR. Justify the real time application.  
(f) Define a real-time application. Differentiate between hard and soft real time systems.  
(g) Explain the differences between multiprogramming, multiprocessing and multitasking. What is the degree of multiprogramming ? How does the long-term scheduler regulates the degree of multiprogramming ? (7x4)
2. (a) Illustrate various reasons on the importance of disk scheduling for I/O operations.  
(b) Disk scheduling algorithms are selected based on certain criteria - Illustrate those criteria.  
(c) Consider a disk queue with I/O requests on the following cylinder in their arriving order :  
6, 10, 12, 54, 97, 73, 128, 15, 44, 110, 34, 45.  
(i) The disk head is assumed to be at Cylinder 23 and moving in the direction of decreasing number of cylinders. The disk consists of a total 150 cylinders. Calculate and show with a diagram the disk head movement using SCAN-scheduling algorithm.  
(ii) Suppose some new requests arrive at Cylinder 60, 65 and 70 while the disk head is processing Cylinder 54. What will happen to these new requests according to the SCAN-scheduling algorithm ? (3+5+10)

3. (a) What are the important tasks to be performed by a distributed OS ?  
 (b) To protect the features of the distributed systems, some design issues must be implemented. Describe each design issues briefly.  
 (c) In a distributed system, various processors execute several processes, but to maximize the performance of the system, there must be balanced distribution of the computational load. What are the different issues faced while implementing distributed process scheduling ? (4+7+7)
4. (a) Define a transaction. What are the properties to be satisfied about a transaction ? What do you mean by inconsistent retrieval and inconsistent update ? Explain with example.  
 (i) What is a timestamp-based locking algorithm used for concurrency control in distributed systems ?  
 (ii) How can the conflict be resolved in the above locking mechanism ?  
 (b) Why do you need data replication in concurrent transactions ? What are the complications due to data replication ? (14+4)
5. (a) In some systems, it is possible to map part of a file into memory. What problems must such systems face ? How is this partial mapping implemented ?  
 (b) Draw the layers of the I/O software system. Write down the function of each layer. (8+10)
6. (a) Implement general semaphore using binary semaphore and avoiding busy-waiting.  
 (b) Consider three processes, all arriving at time zero, with total execution time of 10, 20 and 30 units, respectively. Each process spends the first 20% of execution time doing I/O, the next 70% of time doing computation and the last 10% of time doing I/O again. The operating system uses a shortest remaining compute time first scheduling algorithm and schedules a new process either when the running process gets blocked on I/O or when the running process finishes its compute burst. Assume that all I/O operations can be overlapped as much as possible. For what percentage of time does the CPU remain idle ?  
 (c) Given the following system of processes, explain using Banker's algorithm if it is safe and why ?

Process	Max	Allocation	Available
	A, B, C, D	A, B, C, D	A, B, C, D
P0	6 0 1 2	4 0 0 1	3 2 1 1
P1	1 7 5 0	1 1 0 0	
P2	2 3 5 6	1 2 5 4	
P3	1 6 5 3	0 6 3 3	
P4	1 6 5 6	0 2 1 2	

(6+4 +8)

7. (a) What are the entries of a Segment Map Table ? How a two dimensional logical address is translated to one dimensional physical address ?
- (b) On a system using demand-paged memory, it takes 120 ns to satisfy a memory request if the page is in memory. If the page is not in memory, the request takes (on average) 5 ms. What would the page fault need to be to achieve an effective access time of 1 microsecond ? Assume that the system is only running a single process and the CPU is idle during page swaps.
- (c) Explain in detail the mechanism of public-key encryption and private key encryption.
- (d) Write down the steps performed during user authentication. Explain the different types of passwords used for user authentication. **(4+5+5+4)**

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