No. of Printed Pages : 4

Sl. No.

C0-R4.B2 : OPERATING SYSTEM

DURATION : 03 Hours **MAXIMUM MARKS : 100**

Roll No. : | | | | | | |

Answer Sheet No. : | | | | | | |

Name of Candidate : _____ **; Signature of Candidate :** _____

INSTRUCTIONS FOR CANDIDATES :

- Carefully read the instructions given on Question Paper, Answer Sheet.
- Question Paper is in English language. Candidate has to answer in English Language only.
- **Question paper contains Seven questions. The Question No. 1 is compulsory. Attempt any FOUR Questions from Question No. 2 to 7.**
- **Parts of the same question should be answered together and in the same sequence.**
- **Questions are** to be answered in the **ANSWER SHEET** only, supplied with the Question Paper.
- **Candidate cannot leave the examination hall/ room without signing on the attendance sheet and handing over his/her Answer Sheet to the Invigilator. Failing in doing so, will amount to disqualification of Candidate in this Module/Paper.**
- After receiving the instruction to open the booklet and before answering the questions, the candidate should ensure that the Question Booklet is complete in all respects.

DO NOT OPEN THE QUESTION BOOKLET UNTIL YOU ARE TOLD TO DO SO.

1. (a) Differentiate between Pre-emptive and Non-preemptive scheduling algorithms.

(b) What is the critical section problem ? How is it handled ?

(c) How does time quantum affect CPU efficiency in view of the scheduling strategy ?

(d) In distributed systems, name servers are responsible for name resolution. Justify.

(e) Why is the virtual memory concept used ? Explain with an example.

(f) Differentiate between internal and external fragmentation.

(g) Define a real-time system. Differentiate between hard and soft real-time systems.

(7x4)

2. (a) Explain with reasons the importance of disk scheduling for I/O operations.

(b) Disk scheduling algorithms are selected based on certain criteria. Illustrate various such criteria.

(c) Consider a disk queue with I/O requests on the following cylinders 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 total disk head movement using SCAN-scheduling algorithm.

(ii) Suppose some new requests arrive for the cylinders 60, 65 and 70 while the disk head is processing cylinder 54. How shall these new requests be fulfilled 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. Write down the design issues briefly.

(c) In a distributed system, various processors execute several processes, but to maximize the performance of the system, there must be a 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 by a transaction ?

(b) What do you mean by inconsistent retrieval and inconsistent update ? Explain with an example.

(c) (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 ?

(d) Why is data replication required in concurrent transactions ? What are the complications due to data replication ?

(3+3+8+4)

5. (a) In some systems, it is possible to map part of a file into memory. What restrictions must such systems impose ? 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 or not and why ?

Process	Max A, B, C, D	Allocation A, B, C, D	Available 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 is a two-dimensional logical address translated to a 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 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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SPACE FOR ROUGH WORK