Shirpur Education Society's

R. C. PATEL INSTITUTE OF TECHNOLOGY, SHIRPUR

An Autonomous Institute

(Affiliated to Dr. Babasaheb Ambedkar Technological University, Lonere)

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(स्वायत्त महाविद्यालय)

Programme: B.Tech in Computer Science and Engineering (Data Science)

Year: II/Semester III (Exam Year: 2024-2025)

Subject: Computer System Fundamentals **Time:** 02:30 pm - 04:30 pm (02:00 Hrs.)

Date: 26 Mar 2025

Max Marks: 60

RE END SEMESTER EXAMINATION OSS SEM-III(MARCH 2025)

Instructions:

1. This question paper contains 4 pages
2. Answer to each new question to be started on a fresh page.
3. Figure in right hand side indicates full marks
4. All Four Questions are Compulsory.
5. Assume suitable data wherever necessary.
6. Support your answers with neat, labelled diagrams, wherever necessary.

1. **15**

A. **10**

Given below are the arrival and burst times of four processes P1, P2, P3 and P4. Draw the Gantt Chart using SJF pre-emptive and RR scheduling (Quantum = 4ms). Calculate the average waiting time and average turnaround time.

Process	Arrival time(msec)	Burst time(msec)
P1	0	8
P2	1	4
P3	2	9
P4	3	5

B. . 5

1. Illustrate different Disk Scheduling Methods. 5

---------- OR ----------

2. Explain IO buffering techniques using examples. 5

2. 15

A. Explain the concept of Race conditions and how the critical section helps in preventing them. 5

B. . 10

1. A system has five processes (P0, P1, P2, P3, P4) and three resource types (A, B, C). The following tables represent the Allocation, Max, and Available resources in the system. Use the Banker's Algorithm to determine if the system is in a safe state, and if so, provide the safe sequence. 10

Available Vector: (3, 3, 2)

Process	Allocation (A, B, C)	Maximum (A, B, C)
P0	(0, 1, 2)	(7, 5, 3)
P1	(2, 1, 3)	(3, 2, 3)
P2	(3, 2, 3)	(9, 2, 3)
P3	(2, 3, 2)	(4, 3, 3)
P4	(0, 0, 3)	(3, 3, 3)

Tasks:

1. Calculate the Need matrix for each process.

2. Use the Banker's Algorithm to determine if the system is in a safe state.

3. If the system is in a safe state, provide the safe sequence of process executions.

---------- OR ----------

10

2. 1. Discuss Reader-Writer problem in detail. Compare and contrast the two classical solutions to the Reader-Writer problem: allowing readers to read concurrently when no writer is active and prioritizing writers to avoid writer starvation. What are the trade-offs in terms of system performance and fairness?

3. **15**

A. . **10**

1. Explain the page replacement policies. Implement LRU, OPT, and FIFO for a sequence. Also calculate hits and faults considering the following data. Sequence: 0, 1, 2, 4, 3, 7, 1, 4, 2, 3 and Frame size: 3 **10**

---------- **OR** ----------

2. Explain Virtual memory along with the role of paging and segmentation in virtual memory. **10**

B. Compare RISC and CISC architecture in detail. **5**

4. **15**

A. . **10**

1. Convert the following numbers into their IEEE 754 floating point standard representations: 32-bit single precision and 64-bit double precision floating-point formats. **10**

   i. 13.25

   ii. -7.75

---------- **OR** ----------

2. Describe the Von Neumann Architecture and explain its key components. Based on this architecture, illustrate how system calls function in an operating system. Provide examples of common system calls and categorize them into their respective types. **10**

B. . **5**

1. Explain the concept of hardware multithreading. **5**

---------- **OR** ----------

2. Describe the Types of shared memory multiprocessors. **5**