1411E1202

Candidate's Seat No :_____

Int. M.Sc. (AIML) (NEP) Sem.-3 Examination

DSC-C-AIML-232T

Operating System Concepts

Time : 2-00 Hours] **November-2025** **[Max. Marks : 50**

Instructions: All questions are compulsory. Use of non-programmable scientific calculator is allowed.

Q.1 **(a)** Explain the concept of User Interface Design in OS. **(05)**

(b) Discuss the booting process of an OS. **(05)**

OR

(a) Explain types of operating systems. **(05)**

(b) Explain the significance of containers and application containerization. **(05)**

Q.2 **(a)** Define a process and explain various process scheduling algorithms. Compare preemptive and non-preemptive scheduling with suitable examples. **(05)**

(b) Consider the following set of processes with their arrival times and burst times. Apply the SRTF Scheduling Algorithm **(05)**

Draw the Gantt chart and calculate completion time (CT), turnaround time (TAT), waiting time (WT), and average TAT & WT.

Process	Arrival Time	Burst Time
P1	0	9
P2	1	5
P3	2	12
P4	3	7

OR

(a) What is inter-process communication (IPC)? Discuss the mechanisms of IPC in shared-memory and message-passing systems with examples. **(05)**

(b) Given the following processes, schedule them using the Shortest Remaining Time First (FCFS) Scheduling Algorithm. Construct the Gantt chart and compute CT, TAT, WT, and the average TAT & WT. **(05)**

Process	Arrival Time	Burst Time
P1	0	8
P2	1	4
P3	2	9
P4	3	5

Q.3 **(a)** Explain the critical-section problem. How do synchronization tools like semaphores and monitors solve this issue? Illustrate with an example. **(05)**

P.T.O.

(b) Consider a system with 3 page frames. The reference string is: (05)
7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2
Using the LRU Page Replacement Algorithm, construct the step-by-step page replacement table.
- Show the status of frames after each page reference.
- Count the number of page faults

OR

(a) Describe paging and segmentation in memory management. Compare their advantages and disadvantages, including their impact on system performance. (05)

(b) A process is given 4 page frames and the following reference string: (05)
1, 2, 3, 4, 1, 2, 5, 1, 2, 3, 4, 5
Apply the Optimal Page Replacement Algorithm and:
- Draw the page replacement table after each page reference.
- Calculate the total number of page faults.

Q.4 (a) Explain the working of HDD and NVM scheduling. How do different disk scheduling algorithms impact system performance? (05)

(b) The disk queue contains requests for the following tracks (in the order they arrive): (05)
98, 183, 37, 122, 14, 124, 65, 67
The disk head starts at track 53.
Using the FCFS Disk Scheduling Algorithm,
- Show the order in which the requests will be serviced.
- Calculate the total head movement.

OR

(a) Discuss the structure and operations of a file system. How does the operating system ensure file sharing, file security, and recovery from failures? (05)

(b) Consider a disk with the following pending requests: (05)
82, 170, 43, 140, 24, 16, 190
If the disk head is initially positioned at track 50,
- Use the SSTF Disk Scheduling Algorithm to determine the sequence of servicing.
- Compute the total head movement.

Q.5 Attempt any **TEN** out of **TWELVE:** (Each carries 01 mark) (10)

(1) The interface between user programs and the operating system is provided by _____.

(2) In _____ operating system, a job can utilize the CPU while waiting for I/O operations.

(3) A microkernel-based operating system has a larger kernel size compared to a monolithic OS. (True/False)

(4) A _____ is a program in execution along with its current state and resources.

(5) In preemptive scheduling, a process once started cannot be interrupted until completion. (True/False)

(6) _____ scheduling algorithm may cause starvation but is optimal for minimizing average waiting time.

(7) Semaphores can be used to avoid race conditions in concurrent processes. (True/False)

(8) In memory management, dividing memory into fixed-size blocks is called _____.

(9) The problem of multiple processes entering the critical section simultaneously is called the _____ problem.

(10) In disk scheduling, _____ algorithm services requests in the order of their arrival.

(11) In Optimal page replacement, the page to be replaced is the one that will be used last in the future. (True/False)

(12) A _____ is a collection of related information that is stored on secondary storage.

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