Graphic Era HILL UNIVERSITY
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End Term (Odd) Semester Examination November 2025

Roll no. 2361102113.....

Name of the Course and semester: B.Tech CSE, AI/ML, AI/DS, CYBER, INTEGRATED IX (V SEMESTER)
Name of the Paper: Operating System
Paper Code: TCS 502
Time: 3 hour
Maximum Marks: 100

Note:

(i) All the questions are compulsory.
(ii) Answer any two sub questions from a, b and c in each main question.
(iii) Total marks for each question is 20 (twenty).
(iv) Each sub-question carries 10 marks.

Q1. (2X10=20 Marks)

a. Enumerate and explain the functional categories of operating systems, highlighting their key features and examples. (CO1)

b. Describes the use of system calls in operating system? Explain the life cycle of a system call from user mode to kernel mode. (CO1)

c. Discuss how the long-term and short-term schedulers operate differently in managing CPU and process scheduling. (CO2)

Q2. (2X10=20 Marks)

a. What is a process? How is it different from a program? And also explain the different process states in an Operating System. (CO2)

b. Demonstrate the working of Peterson's algorithm for two processes. (CO2)

c. Suppose that the following processes arrive for execution at the times indicated. Each process will run the listed amount of time.

Process	Arrival Time	Burst Time
P1	0	8
P2	1	5
P3	2	10
P4	3	4

i) Give the average turnaround time for these processes with the FCFS scheduling algorithm? Draw the Gantt chart depicting process execution.
ii) Repeat part (i) for SRTF scheduling algorithm. (CO2, CO5)

Q3. (2X10=20 Marks)

a. Explain the conditions that lead to deadlock in an operating system. How can a resource allocation graph be used to detect or represent it? Provide a suitable example. (CO4)

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b. Discuss starvation in scheduling. Which algorithm is most likely to cause it and why? (CO2)

c. Consider the following page-reference String:

1, 3, 0, 3, 5, 6, 3, 4, 5, 6, 2, 1, 2, 4, 3, 6, 3, 5, 7, 2

Assume that there are four frames and initially all the frames are empty.

Calculate the following:

(i) The number of page faults using FIFO, LRU, and Optimal page replacement algorithms.

(ii) The hit ratio for each algorithm. (CO5, CO6)

Q4. (2X10=20 Marks)

a. Explain how interrupt handling improves CPU utilization. Why is context switching considered an overhead? Explain with OS design perspective. (CO1)

b. Describe what thrashing means in the context of virtual memory. Discuss any two operating system scenarios that could result in thrashing. (CO3)

c. Suppose that a disk drive has 200 cylinders, numbered 0 to 199. The drive currently Services a request at cylinder 53, and the previous request was at cylinder 37. The queue of pending request in FIFO order is:

98, 183, 41, 122, 14, 124, 65, 67

Starting from the current position, what is the total distance (in cylinders) that the disk arm moves to satisfy all pending requests? For each of the following algorithms:

i) FCFS
ii) SSFT
iii) SCAN
iv) LOOK
v) C-SCAN

(CO5,CO6)

Q5. (2X10=20 Marks)

a. A process of size 16 KB must be loaded into memory blocks of size 10 KB, 16 KB, 18 KB, and 20 KB. Which allocation (First Fit, Best Fit, Worst Fit) gives the best result and why? (CO2, CO5)

b. A file is stored using linked allocation. If the 5th block is corrupted, explain what happens to rest of the file during sequential access. (CO6)

c. Describe the following:

i) Hard Real-Time and Soft Real-Time Systems
ii) Paging and segmentation
iii) Spooling and Buffering
iv) Blocking and Non-blocking System Calls (CO2,CO3,CO6)