



Roll No. :

MEERUT INSTITUTE OF ENGINEERING AND TECHNOLOGY

NH-58, Delhi-Roorkee Highway, Baghpat Road, Meerut – 250 005 U.P.

Pre-University Test (PUT): Even Semester 2022-23

Course/Branch : B Tech -CSE, IT, CSIT, DS, IOT, AI, and AI/ML

Semester : IV

Subject Name : Operating Systems

Max. Marks: 100

Subject Code : KCS 401

Time : 180 min

CO-1: On the completion of this course, the student will be able to understand the basic concept of the Operating system.

CO-2: On the completion of this course, the student will be able to discuss concurrent processes and their execution.

CO-3: On the completion of this course, the student will be able to analyze the concept of process scheduling and deadlock.

CO-4: On the completion of this course, the student will be able to select different approaches to memory management techniques.

CO-5: On the completion of this course, the student will be able to apply the concepts of disk scheduling.

Section – A # 20 Marks (Short Answer Type Questions)

Attempt **ALL** the questions. **Each Question is of 2 marks (10 x 2 = 20 marks)**

Q. No.	COx	Question Description # Attempt ALL the questions. Each Question is of 2 marks.
1	A	CO1 Define the term operating system and mention its major functions. (K1)
	B	CO1 What is Spooling? (K1)
	C	CO2 Differentiate between concurrent execution and parallel execution. (K2)
	D	CO2 What is the use of inter-process communication and context switching? (K1)
	E	CO3 Describe the typical elements of the process control block. (K2)
	F	CO3 What are the various scheduling criteria for CPU scheduling? (K1)
	G	CO4 Explain the difference between internal and external fragmentation. (K2)
	H	CO4 Write the difference between paging and segmentation. (K2)
	I	CO5 Write a short note on I/O buffering. (K1)
	J	CO5 Discuss the criteria for choosing a file organization. (K2)

Section – B # 30 Marks (Medium Answer Type Questions)

Attempt **ALL** the questions. **Each Question is of 6 marks. (5 x 6 = 30 marks)**

Q.2 (CO-1): Explain in detail about the Monolithic and Microkernel Systems. (K1-K2)

OR

Explain in detail about the Operating System Services. (K1-K2)

Q.3 (CO-2): State the Critical Section Problem. Illustrate the software-based solution to the Critical Section problem. (K2-K3)

OR

What is the Dining Philosophers' problem? Discuss the solution to the Dining philosopher's problem using semaphores. (K2-K3)

Q.4 (CO-3): Differentiate between the user thread and kernel thread. What is thread cancellation? (K2-K4)

OR

Describe Banker's algorithm for deadlock avoidance and safe allocation both. Discuss the usage of the wait-for-graph method. (K2-K4)

Q.5 (CO-4): When will the page faults occur? What is the procedure for handling the page fault? (K1-K3)

OR

What are the causes of thrashing? What are the steps taken by the system to eliminate this problem? (K1-K3)

Q.6 (CO-5): Describe schemes for defining the logical structure of the directory. (K1-K2)

OR

List the various file attributes, file operations, and file types. Explain about the file system mounting and file sharing. (K1-K2)

Section – C # 50 Marks (Medium / Long Answer Type Questions)

Attempt **ALL** the questions. **Each Question is of 10 marks.**

Q.7 (CO-1): Attempt any ONE question.

- What do you understand by system call? How is a system call made? How a system call is handled by the system? Choose a suitable example for explanation. (K1-K3)
- Differentiate between (**with one suitable example**) (K1-K3)

i) Interactive and Batch Processing System

ii) Multiprogramming and Time-Sharing System

Q.8 (CO-2): Attempt any ONE question.

- State the Producer-consumer problem. Given a solution to the solution using semaphores. (K1-K3)
- State the Critical Section Problem with an example. Illustrate the software-based solution to the Critical Section problem. (K1-K3)

Q.9 (CO-3): Attempt any ONE question.

- Consider the following snapshot of a system:

Process Id	Max				Allocation				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P0	5	0	1	2	3	0	0	1	3	2	1	1
P1	2	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				

By using Banker's algorithm, answer the following questions: (K2-K4)

- i. How many resources of types A, B, C, and D are there?
- ii. What are the contents of the need matrix?
- iii. Find if the system is in a safe state? If it is, find the safe sequence.

- b. Consider the set of 5 processes whose arrival time and burst time are given below- (K2-K4)

Process Id	Arrival Time	Burst Time
P1	3	1
P2	1	4
P3	4	3
P4	0	6
P5	2	2

- i. If the CPU scheduling policy is **SJF non-preemptive**, calculate the average waiting time and average turnaround time.
- ii. If the CPU scheduling policy is **SJF preemptive**, calculate the average waiting time and average turnaround time.

Q.10 (CO-4): Attempt any ONE question.

- a. Consider the following page reference string: (K4)

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

How many page faults would occur for the **Optimal and LRU page replacement algorithm**?

Assume that there are **three frames and all frames are initially empty**.

- b. Consider the following segment table: (K4)

Segment No	Limit	Base
0	700	1221
1	15	2301
2	105	90
3	520	1327
4	98	1952

Calculate the physical address for the following logical addresses:

- i.) **0, 430**
- ii.) **1, 11**
- iii.) **2, 100**
- iv.) **3, 425**
- v.) **4, 95**

Q.11 (CO-5): Attempt any ONE question.

- a. Write short notes on: (K2)

i.) I/O buffering

ii.) Sequential File

- b. Consider an imaginary disk having **200 cylinders**. Suppose the head of the moving disk is currently serving a request at **track 55** having direction towards the highest cylinders. Given the order of request is:

65, 170, 35, 120, 20, 150

If the queue request is kept in FIFO order, what is the **total head movement** to satisfy these requests for the following disk scheduling algorithm? (K2-K4)

i.) FCFS

ii.) SSTF

iii.) C-LOOK

iv.) C-SCAN

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