QP Code: RA23BTECH135 | Reg. No | | | | | | | | | | | AY 23

GANDHI INSTITUTE OF ENGINEERING AND TECHNOLOGY UNIVERSITY, ODISHA, GUNUPUR
(GIET UNIVERSITY)

B. Tech (Fourth Semester - Regular) Examinations, April – 2025

23BCSPC24004/23BCMPC24004/23BCDPC24004– Operating System

(CSE, CSE-AIML, CSE-DS)

Time: 3 hrs | Maximum: 60 Marks

(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

	Q.1. Answer ***ALL*** questions	CO #	Blooms Level
a.	State the difference between a program and a process.	CO1	K1
b.	Explain the terms "CPU Scheduler and Job Scheduler".	CO1	K2
c.	Write a short note on Cascade Termination and Inter-Process Communication.	CO2	K1
d.	What is demand paging?	CO2	K1
e.	Define the terms "Base register and Limit register".	CO1	K1

PART – B **(10 x 5 = 50 Marks)**

Answer ***ALL*** the questions

		Marks	CO #	Blooms Level
2. a.	Briefly explain the pros and cons of Batch Processing, Multi-Programming, and Time Sharing systems.	5	CO1	K1
b.	What are the components of an operating system? Explain their role in system operation.	5	CO2	K2
	(OR)			
c.	What is a distributed system? What are the types? Write down the advantages of a distributed system.	5	CO1	K1
d.	What is the role of a scheduler? Explain the difference between long-term scheduler and short-term scheduler.	5	CO2	K2
3.a.	Using a suitable example, briefly explain the usage of system calls: fork(), exit(), wait(), getpid(), exec()	5	CO3	K3
b.	Given a set of processes arrived in ready queue.	5	CO4	K3

Process	P1	P2	P3	P4	P5
Arrival Time	0	1	2	3	4
Burst Time	10	1	2	1	5
Priority	3	1	4	5	2

Prepare a Gantt chart and then find the average waiting time and average turnaround time using preemptive priority scheduling.

(OR)

c.	Explain the execution process while sharing a common bounded buffer by two processes: producer() and consumer().	5	CO3	K3
d.	Given a set of processes arrived in ready queue.	5	CO4	K3

Process	Arrival Time	Burst Time
P1	0	10
P2	0	3
P3	2	6
P4	2	2

Prepare a Gantt chart and then find the average waiting time and average turnaround time using preemptive (shortest job first) SJF scheduling.

4.a.	Explain the TestandSet() instruction. How does it work, and how can it be used to solve the critical section problem?	5	CO4	K3
b.	Describe the Reader-Writer Problem. Provide a semaphore-based solution for both the first and second variations of the problem.	5	CO3	K3
	(OR)			
c.	Consider a system with 5 processes (P0 to P4) and 3 resource types (A, B, C). The following tables represent the Allocation, Maximum need, and Available resources.			

Process	P1	P2	P3	P4	P5
Allocation (A, B, C)	0, 1, 0	2, 0, 0	3, 0, 2	2, 1, 1	0, 0, 2
Maximum (A, B, C)	7, 5, 3	3, 2, 2	9, 0, 2	2, 2, 2	4, 3, 3

	Available Resources: A = 3, B = 3, C = 2 Apply the Banker's Safety Algorithm to check if the system is in a safe state. If a process P1 requests additional resources (1, 0, 2)**,** check whether the request can be granted using the Resource Request Algorithm**.**	5	CO4	K3
d.	Discuss the implementation of semaphores using wait() and signal() operations.	5	CO4	K3
5.a.	Describe how a Page Mapping Table (PMT) is used in the paging mechanism for address translation.	5	CO2	K3
b.	What are the four necessary conditions for deadlock? Provide real-life examples for each.	5	CO2	K2
	(OR)			
c.	Differentiate between fixed partitioning and variable partitioning. Explain the concept of partition management in memory.	5	CO2	K2
d.	Briefly explain the working process of the dining philosopher problem for sharing resources effectively.	5	CO3	K3
6.a.	Consider the following reference string representing page requests in a system: Reference String: 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 5, 3, 6, 4, 2 The system has 3 page frames available. Simulate the LRU page replacement algorithm and calculate the number of page faults.	5	CO4	K3
b.	Given a disk queue with requests to read data from the following cylinder numbers: 86, 147, 91, 177, 40, 11, 66, 130, 150, 27, and assuming that the initial position of the read/write head is at cylinder 100. Apply the FCFS (First-Come, First-Served) disk-scheduling algorithms to determine the order in which the requests are processed. Assume the disk arm is initially moving toward the higher-numbered cylinders. Find the total number of head movements required.	5	CO3	K4
	(OR)			
c.	Consider the following reference string representing page requests in a system: Reference String: 5, 3, 6, 4, 2, 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2 The system has 3 page frames available. Simulate the FIFO page replacement algorithm and calculate the number of page faults.	5	CO4	K3
d.	Given a disk queue with requests to read data from the following cylinder numbers: 98, 37, 183, 122, 14, 124, 56, 67, 90, 25, 145, and assuming that the initial position of the read/write head is at cylinder 50. Apply the SSTF (Shortest Seek Time First) disk scheduling algorithms to determine the order in which the requests are processed. Find the total number of head movements required.	5	CO3	K4

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