Roll No							

End Semester Examination 2024

Name of the Course: BCA
Semester: 2nd

Name of the Paper*:* **Introduction to Operating System**
Paper Code: TBC-203

Time: 3 Hour's
Maximum Marks: 100

Note:

(i) All Questions are compulsory.
(ii) Answer any two sub questions among a, b and c in each main question.
(iii) Total marks in each main question are twenty.
(iv) Each question carries 10 marks.

Q1	**(10 X2 = 20 Marks)**	**CO1**
(a)	Explain the operations performed by operating systems, including process management, memory management, storage management, and protection/security mechanisms.	
(b)	Explain various design structures, which can be used in the design of operating system and explain any two of them.	
(c)	Explain the concept of system calls and their role in facilitating communication between user programs and the operating system.	
Q2	**(10 X2 = 20 Marks)**	**CO2**
(a)	Describe the concept of a process in operating systems, including its components and characteristics. Explain the lifecycle of a process and the transitions between different states.	
(b)	Define interprocess communication and its importance in multitasking environments. Discuss the advantages and disadvantages of different IPC mechanisms, including message passing and shared memory	
(c)	Compare and contrast different multithreading models, including one-to-one, many-to-one, and many-to-many threading models. Discuss the advantages and disadvantages of each model in terms of performance, resource utilization, and portability.	
Q3	**(10 X2 = 20 Marks)**	**CO3**
(a)	Define the critical-section problem and its significance in concurrent programming. Explain how race conditions can occur when multiple processes or threads access shared resources concurrently.	
(b)	Describe Peterson's solution to the critical-section problem. Explain how Peterson's algorithm ensures mutual exclusion by using turn variables and flags.	
(c)	Discuss different types of semaphores, including binary semaphores and counting semaphores. Explain how each type of semaphore can be used to implement synchronization patterns such as mutual exclusion, producer-consumer, and reader-writer.	

Q4 (10 X2 = 20 Marks) CO4

(a) Consider the following system with four processes:

Process	Arrival Time	Burst Time
P_1	0	8
P_2	1	4
P_3	2	9
P_4	3	5

What is the average waiting time and average turn-around time for the system using the following:

i. FCFS Scheduling Algorithm.

ii. Non-Preemptive SJF Algorithm

iii Preemptive SJF Algorithm

(b) Discuss different approaches for handling deadlocks in operating systems, including deadlock prevention, deadlock avoidance, deadlock detection, and recovery from deadlock.

(c) Describe the banker's algorithm for safe allocation. Consider the following snapshot of a system with three processes and three resource types:

Process	Allocated			Maximum			Available		
	R_1	R_2	R_3	R_1	R_2	R_3	R_1	R_2	R_3
P_1	2	2	3	3	6	8	7	7	10
P_2	2	0	3	4	3	3			
P_3	1	2	4	3	4	4			

i. What is the content of Need matrix?

ii. What are the total numbers of resources of types R_1, R_2, R_3.

iii. Is the current allocation state safe?

iv Would the request from P_2 <1,0,0> be granted in the current system?

Q5 (10 X2 = 20 Marks) CO5

(a) Explain demand paging and its role in virtual memory management. Discuss how demand paging allows processes to be loaded into main memory on demand, as opposed to being loaded in their entirety.

(b) Define paging and its role in memory management. Explain how paging divides main memory and processes into fixed-size blocks called pages.

(c) How many page faults would occur for the following reference string for 4-page frames using LRU and using FIFO algorithm.
1,2,3,4,5,5,3,4,1,6,7,8,7,8,9,7,8,9,5,4,5,4,2