

**Final Assessment Test (FAT) - July/August 2023**

Programme	B.Tech.	Semester	Fall Inter Semester 22-23
Course Title	OPERATING SYSTEMS	Course Code	BCSE303L
Faculty Name	Prof. Valarmathi Sudhakar	Slot	E1+TE1
		Class Nbr	CH2022232500984
Time	3 Hours	Max. Marks	100

Section-A (7 X 10 Marks)**Answer all questions**

- Q1. You are a software engineer working on a project that involves developing an operating system [10]
for a new line of smart devices. The previous version of the operating system faced several design issues, leading to an unresponsive system and frequent crashes. Your team is determined to address these issues in the new version to provide a seamless user experience. In the context of operating system design, describe five major design issues faced in the previous version of the operating system and propose individual solutions to mitigate them in the new version with a suitable sketch.
- Q2. Write a C program that creates three processes: A, B, and C. Each process has a specific role, as [10]
described below:

Process A: This process reads a series of numbers (n numbers) from the keyboard and counts the number of even numbers among them. The count of even numbers is then sent to Process B.

Process B: This process receives the count of even numbers from Process A and calculates the factorial of that count. The factorial result is then sent to Process C.

Process C: This process receives the factorial value from Process B and determines whether the value is a prime number or not.

- Q3. In a restaurant, there are five dish orders that need to be completed. The arrival time of each [10]
order and the time taken to prepare the order (burst time) are provided in the below table.

Process (Dishes)	Burst Time	Arrival Time
D1	9	8
D2	4	4
D3	3	7
D4	7	3
D5	2	1

- a. Draw the Gantt charts that illustrate the preparation of these dishes using the following scheduling algorithms: FCFS and Round Robin (time quantum 2).
- b. What is the average turnaround time and average waiting time for each of the scheduling algorithms mentioned in Part A?
- c. Analyze the performance of the algorithms based on the above scenario.
- Q4. Consider the following snapshot of a system:

[10]

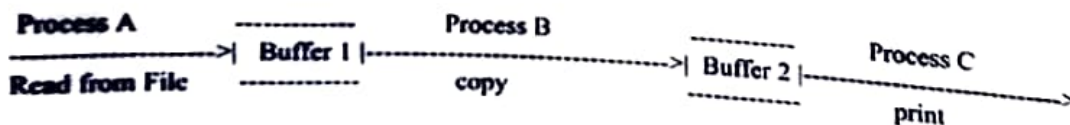
Process	Allocation			Request			Available		
	R1	R2	R3	R1	R2	R3	R1	R2	R3
P1	1	0	1	0	0	1	0	1	0
P2	1	1	0	0	1	1			
P3	0	1	1	0	1	0			
P4	0	0	0	0	1	1			

- a) Draw the resource allocation graph based on the above table.
- b) Is the system potentially deadlocked? If yes, identify the processes involved in the deadlock and provide a recovery mechanism. If not, find the correct safe sequence for the processes.
- Q5. a) Consider the methods used by processes M1 and M2 for accessing their critical sections whenever needed, as given below. The initial values of shared Boolean variables BV1 and BV2 are 0 and 1 respectively. Check whether mutual exclusion and progress were achieved or not. justify your answer. (4 Marks)

[10]

Method used by M1 :	Method used by M2 :
while(BV1==BV2): Critical section BV1 = BV2;	while(BV1!=BV2): Critical section BV2 = !(BV1);

- b) Three processes are involved in printing a file (pictured below). Process A reads the file data from the disk to Buffer-1, Process B copies the data from Buffer-1 to Buffer-2, and Process C takes the Data from Buffer-2 and prints it. (6 Marks)



Assuming all three processes operate on one file record at a time, the capacity of both buffers is one record. Write the pseudocode to coordinate the three processes using semaphores.

- Q6. VIT librarian is planning to design a library system with multiple readers and writers while accessing the shared database of books. Students and faculties can only read the database, while only library staffs can read and write into the database. To ensure that the database is not corrupted or overwritten, only one library staff has exclusive access to the database while writing. Readers have shared access to the database while reading.

[10]

- a) What values would you assign to the semaphores?
- b) Provide the corresponding pseudo-code for both the readers and writers to ensure that the semaphore is properly synchronized with the readers and writers requests to access the database.

07. ABC Corporation is planning to implement virtualization technology to improve its IT infrastructure. They have a diverse range of applications, including web servers, database servers, and legacy applications. As an IT consultant, you are tasked with providing guidance on the virtualization strategy to improve the company's performance. What are the key factors that you will suggest to ABC Corporation when evaluating and selecting a virtualization platform for their business needs? Justify your answer in detail. [10]

Section-B (2 X 15 Marks)

Answer all questions

08. Consider a paging system with a RAM size of three physical frames that are initially empty. The CPU is currently executing a process with the following order of page requests: 3, 2, 8, 3, 8, 3, 6, 1, 2, 6, 3, 9, 3, 1, 9, 8, and 3. Apply FIFO, LRU, and Optimal Page replacement algorithms and calculate the Page Fault and Page Hit Ratio. Comment on the performance of the algorithms based on the above scenario. [15]
09. a) Consider a disk drive with 500 cylinders, numbered 0 to 499. Assume that the arm is at cylinder 220 and the previous request was at cylinder 141. The disk drive receives the following cylinder requests: 20, 42, 325, 60, 288, 124, 270, 105, 93, 233, 498, and 200 in order. A seek takes 3 msec per cylinder moved. Compute the total seek time needed to serve these requests using the following algorithms and compare which among them is better for this scenario. [15]

- i) FCFS (5 Marks)
ii) C-SCAN (5 Marks)

b) A system uses segmentation with variable-sized segments as a memory management technique. The segment table of the system contains the following entries for base addresses and limit values specified in bytes:(5 Marks)

Segment 1: Base = 10, Limit = 1024
Segment 2: Base = 2048, Limit = 512
Segment 3: Base = 4096, Limit = 256
Segment 4: Base = 5000, Limit = 200

Map the given reference byte generated by the CPU to its corresponding physical address and find the legal or illegal references.

- i) Segment 1: Reference byte= 1000
ii) Segment 2: Reference byte = 512
iii) Segment 3: Reference byte = 260
iv) Segment 2: Reference byte = 400
v) Segment 4: Reference byte =199

