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SOMAIYA VIDYAVIHAR UNIVERSITY

Semester: July 2024 –November 2024 Maximum Marks: 100 Examination: ESE Examination		Duration:3 Hrs.
Programme code: 04 Programme: B. Tech Information Technology	Class: TY	Semester: V (SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering	Name of the department: Information Technology	
Course Code: 116U04C502	Name of the Course: Operating Systems	
Instructions: 1) Draw neat diagrams 2) All questions are compulsory 3) Assume suitable data wherever necessary		

Que. No.	Question	Max. Marks
		20
Q1	Solve any **Four**	
i)	Discuss the primary goals of an operating system.	5
ii)	What are the different types of system calls? Give examples of each type and explain their role in OS functionality. (any five)	5
iii)	Discuss the key features and challenges of real-time operating systems (RTOS) in handling time-sensitive applications.	5
iv)	What is a microkernel? How does it differ from a monolithic kernel in terms of functionality and performance?	5
v)	How do parallel and distributed operating systems differ in their approach to resource management and task execution?	5
vi)	Discuss the key components of a modern UNIX system.	5

Que. No.	Question	Max. Marks
		10
Q2 A	Solve the following	
i)	Consider the following set of processes and construct the Gantt Chart using the Shortest Remaining Time First scheduling algorithm. Calculate the average waiting time and average turnaround time for all processes.	5

Process	Arrival Time	Burst Time
P1	0	8
P2	2	4
P3	4	2
P4	5	1
P5	7	3

ii)	Consider the following set of processes and construct the Gantt Chart using the Priority Scheduling algorithm. Calculate the average waiting time and average turnaround time for all processes.	5

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

	OR	

Q2 A	Discuss types of schedulers in an operating system. Explain how they contribute to efficient process management, providing examples of when each type of scheduling would be used.	10
Q 2 B	Solve any **One**	
i)	Explore the concept of the Process Control Block (PCB) in modern operating systems. How does the PCB contribute to process management, and what key elements does it store for the efficient management of processes?	10
ii)	Analyse the role of multithreading in modern operating systems. How do many-to-one, one-to-one, and many-to-many multithreading models operate, and what are their implications for system performance and scalability?	10

Que. No.	Question	Max. Marks
Q3	Solve any **Two**	**20**
i)	Explain the Dining Philosopher problem in detail, including its significance in studying synchronization issues in operating systems. How does deadlock occur in this problem, and what strategies can be implemented to prevent or avoid it?	10
ii)	Consider the following system with 5 processes (P0, P1, P2, P3, P4) and 4 resource types (A, B, C, D).	10

Process	Max (A, B, C, D)	Allocation (A, B, C, D)	Available (A, B, C, D)
P0	7, 5, 3, 4	3, 2, 1, 1	2, 1, 2, 0
P1	3, 2, 2, 5	1, 0, 1, 2	
P2	9, 0, 2, 3	3, 0, 1, 1	
P3	2, 2, 3, 2	1, 1, 2, 0	
P4	4, 3, 3, 4	0, 2, 2, 2	

Using Banker's algorithm, answer the following questions:

a. How many resources of type A, B, C, D are there?
b. What are the contents of the Need matrix?
c. Is the system in a safe state? If it is, find the safe sequence.

iii)	Describe the principles of deadlock in operating systems. Compare and contrast deadlock prevention, deadlock avoidance, deadlock detection, and deadlock recovery techniques, providing real-world examples where these techniques are applied.	10

Que. No.	Question	Max. Marks
Q4	Solve any **Two**	**20**
i)	Explain the process of address translation in systems using paging and segmentation. How do operating systems manage logical to physical address mapping in both schemes, and what are the advantages and disadvantages of each?	10
ii)	Explain how virtual memory can be implemented using a combination of paging and segmentation. Describe the advantages and challenges of this approach with relevant examples.	10
iii)	Compare LRU and Optimal page replacement policies, explain with examples how each replaces pages and analyse where each is most efficient.	10

Que. No.	Question	Max. Marks
Q5	Solve any **four**	**20**
i)	Explain the various types of I/O devices and discuss the characteristics that influence how an operating system manages them.	5
ii)	Explain the LOOK and C-LOOK disk scheduling algorithms. How do they improve upon the SCAN and C-SCAN algorithms?	5
iii)	Discuss the concept of file organization. How does an operating system manage different file access methods?	5
iv)	Explain how file sharing is managed in a multi-user operating system. What are the potential security risks involved?	5
v)	What is the role of secondary storage management in file allocation? Compare and contrast two file allocation methods.	5
vi)	Compare and contrast the NTFS and ext4 file systems in Linux. How do they differ in terms of performance and reliability?	5