OR iii. Explain following page replacement algorithms with examples: **6**
(a) FIFO
(b) LRU
(c) Optimal page replacement algorithm

Q.6 Attempt any two:
i. Explain working of Unix file system. **5**
ii. Explain SCAN disk scheduling algorithm with example. **5**
iii. Explain any two file allocation methods. **5**

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Total No. of Questions: 6 *Total No. of Printed Pages:4*

Enrollment No.....

Faculty of Engineering
End Sem Examination May-2024
CB3CO06 Operating Systems

Programme: B.Tech. Branch/Specialisation: CSBS

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

Q.1 i. Which component of an operating system is responsible for translating user commands into machine language instructions? **1**
(a) Kernel (b) Shell (c) File system (d) Device drivers

ii. Which of the following is not a feature of a multi-user operating system? **1**
(a) Time-sharing
(b) Simultaneous execution of multiple programs
(c) Isolation of processes from each other
(d) Limited access control and permissions for different users

iii. What is the primary difference between a process and a thread? **1**
(a) Processes are heavier than threads
(b) Processes have their own address space, while threads share the address space of the process that created them
(c) Processes have a single execution flow, while threads can have multiple execution flows
(d) Processes cannot be pre-empted, while threads can

iv. What is the main advantage of pre-emptive scheduling over non-pre-emptive scheduling? **1**
(a) Pre-emptive scheduling is simpler to implement
(b) Pre-emptive scheduling reduces context switching overhead
(c) Pre-emptive scheduling provides better response time and fairness
(d) Pre-emptive scheduling avoids deadlocks

v. Which IPC mechanism is best suited for communication between processes on the same system? **1**
(a) Message queues (b) Shared memory
(c) Semaphores (d) Pipes

vi. Which technique is used to prevent deadlocks by ensuring that at least one resource is released if a process cannot immediately acquire all of its requested resources? **1**
(a) Deadlock detection (b) Deadlock avoidance
(c) Deadlock recovery (d) Deadlock prevention

vii. In virtual memory management, what is the role of the page table? **1**
(a) Maintains a mapping between physical memory addresses and virtual memory addresses
(b) Determines the order in which processes are executed
(c) Manages the allocation and deallocation of memory blocks
(d) Handles communication between hardware devices and the operating system

viii. Which of the following is NOT a function of memory management in an operating system? **1**
(a) Allocation (b) Protection
(c) File indexing (d) Deallocation

ix. Which of the following disk scheduling algorithms uses the Shortest Seek Time First (SSTF) strategy? **1**
(a) First Come First Serve (FCFS)
(b) Scan (Elevator)
(c) C-SCAN
(d) Look

x. What does an operating system do in the context of file management? **1**
(a) Controls the operation of input/output devices
(b) Allocates and manages memory space
(c) Organizes and manipulates files and directories
(d) Interprets and executes program instructions

Q.2 i. Explain concept of virtual machine. **2**
ii. Explain any three types of operating system. **3**
iii. Explain layered archicture and micro-kernel archicture of operating system. **5**

OR iv. Explain interrupt, why operating system is termed as interrupt driven program. **5**

Q.3 i. Differentiate between pre-emptive and non-pre-emptive scheduling. **2**
ii. What is process scheduling? Also describe the role of schedulers in process scheduling. Explain various types of schedulers with the help of diagram show working of each scheduler. **8**
OR iii. Consider three process as P1, P2 and P3,P4,P5 with their CPU burst times(in ms) as given: **8**

Process	Arrival time	Burst time
P1	0	5
P2	1	2
P3	2	1
P4	3	4
P5	4	3

Assuming a time quantum of 2ms. Provide a Gantt chart illustrating the execution of these jobs using Round Robin scheduling algorithm and also calculate average waiting time and average turnaround time.

Q.4 i. What is deadlock? State all the necessary conditions for deadlock to arise. **3**
ii. Explain Bankers algorithm in detail with example. **7**
OR iii. Explain the producer-consumer problem in the context of operating systems. Describe a common solution to this problem using semaphores. Discuss issues that may arise when implementing this solution and how they can be mitigated. Provide an example scenario where the producer-consumer problem could occur in a real-world computing environment. **7**

Q.5 i. Differentiate between contiguous and non- contiguous memory allocation techniques with example. **4**
ii. Describe with the help of diagram the concept of paging and its two disadvantages also explain how paging differs from segmentation and discuss when each technique might be more suitable in an operating system environment. **6**

Marking Scheme

CB3CO06 (T) Operating Systems

Q.1	i)	B		**1**
	ii)	D		**1**
	iii)	B		**1**
	iv)	C		**1**
	v)	B		**1**
	vi)	B		**1**
	vii)	A		**1**
	viii)	C		**1**
	ix)	A		**1**
	x)	C		**1**
Q.2	i.	Explain Concept of Virtual Machine.		**2**
		Definition	-1 mark	
		Example	-1 mark	
	ii.	Explain Any Three Types of Operating System.		**3**
		Explanation of each three types	-1 mark	
	iii.	Explain Layered Archicture and Micro-Kernel Archicture of Operating System.		**5**
		Layered Archicture (diagram, explanation)	- 2.5 mark	
		Micro-Kernel Archicture (diagram, explanation)	-2.5 mark	
OR	iv.	Explain Interrupt, why Operating System is Termed as Interrupt Driven Program		**5**
		Definition	-2 mark	
		Explanation + example	-3 mark	
Q.3	i.	Differentiate between pre-emptive and non-pre-emptive scheduling.		**2**
		Difference (example)	-1 mark	
	ii.	What is process scheduling also describe the role of schedulers in process scheduling explain various types of schedulers with the help of diagram show working of each scheduler.		**8**
		Explanation	-2 mark	
		Role	-1 mark	
		3types	-3 mark	
		Diagram	-2 mark	
OR	iii.	Consider three process as P1, P2 and P3,p4,p5 with their CPU burst times(in ms) as given:		**8**

Process	Arrival time	Burst time
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Assuming a time quantum of 2ms. Provide a Gantt chart illustrating the execution of these jobs using Round Robin scheduling algorithm and also calculate average waiting time and average turnaround time

Gantt chart	-2 marks
average waiting	-2 marks
average turnaround time	-2 marks
solution steps	-2 marks

Q.4	i.	What is Deadlock? State all the necessary conditions for deadlock to arise.		**3**
		Definition	-1 mark	
		Conditions	-2 mark	
	ii.	Explain Bankers algorithm in detail with example.		**7**
		Explanation	-2 mark	
		Example	-3 mark	
		Solution Steps	-2 mark	
OR	iii.	Explain the producer-consumer problem in the context of operating systems. Describe a common solution to this problem using semaphores also discuss issues that may arise when implementing this solution and how they can be mitigated also, provide an example scenario where the producer-consumer problem could occur in a real-world computing environment.		**7**
		Explanation	-2 mark	
		Solution	-2 mark	
		Issue	-1 mark	
		Example	-2 mark	

Q.5 i. Differentiate between contiguous and non- contiguous memory allocations techniques with example. **4**

Difference + example for each -2 mark

ii. Describe with the help of diagram the concept of paging and its two disadvantages also explain how paging differs from segmentation and discuss when each technique might be more suitable in an operating system environment. **6**

Diagram+ Concept -3 mark

Disadvantages + difference -3 mark

OR iii. Explain following page Replacement algorithms with examples: **6**

a) FIFO
b) LRU
c) Optimal page replacement algorithm.

Explanation of each -2 mark

Q.6

i. Attempt any two:

ii. Explain working of Unix file system. **5**

Diagram -2 mark

Working -3 mark

iii. Explain SCAN disk scheduling algorithm with example. **5**

Explanation + diagram -3 marks

Example -2 mark

iv. Explain any two file allocation methods. **5**

Explanation of each 2.5 mark

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