SETHU INSTITUTE OF TECHNOLOGY, KARIAPATTI

(An Autonomous Institution Affiliated to Anna University, Chennai)

Regulation 2021(Question Bank)

Department: CSBS	**Subject name : OPERATING SYSTEM**
Subject code : 21UCB403	**Question Pattern : Part A : 10 * 2 =20** **Part B : 5 * 16 =80**
Course Coordinator :	**Time Duration :**

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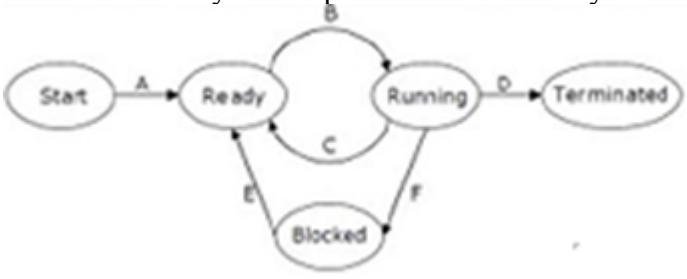
	PART – A (2 Marks)		
	UNIT - I (Minimum 8 Questions)		
1.	What is the relationship between operating systems and computer hardware?	CO1-U	-
2.	What are the primary differences between Network Operating System and Distributed Operating System?	CO1-U	-
3.	What inconveniences that a user can face while interacting with a computer system, which is without an operating system?	CO1-R	-
4.	What is the difference between Job and Process?	CO1-R	-
5.	What are the advantages of multiprogramming?	CO1-R	-
6.	What are the advantages of Multiprocessing or Parallel System?	CO1-R	-
7.	What are the differences between Batch processing system and Real Time Processing System?	CO1-U	-
8.	What is Inter-process communication?	CO1-R	-
	UNIT - II (Minimum 8 Questions)		
1.	What is a process scheduler? State the characteristics of a good process scheduler?	CO1- R	-
2.	In the following process state transition diagram for a uniprocessor system, assume that there are always some processes in the ready state:  Now consider the following statements: If a process makes a transition D, it would result in another process making transition A immediately. I. A process P2 in blocked state can make transition E while another process P1 is in running state.	CO2-AP	PO1

	II. The OS uses preemptive scheduling. III. The OS uses non-preemptive scheduling. Which of the above statements are TRUE? And justify your answer		
3.	Differentiate preemptive and non-preemptive scheduling	**CO1- U**	**-**
4.	The purpose of Scheduling Algorithm is to maximize or minimize the below Optimization Criteria • _____ CPU utilization • _____ Throughput • _____ Turnaround time • _____ Waiting time • _____ Response time	**CO1- U**	**-**
5.	What are the requirements that a solution to the critical section problem must satisfy?	**CO1- R**	**-**
6.	Name two hardware instructions and their definitions which can be used for implementing mutual exclusion.	**CO1- R**	**-**
7.	Compare and contrast Single-threaded and multi-threaded process.	**CO1- U**	**-**
8.	What are the various scheduling criteria for CPU scheduling?	**CO1- R**	**-**
	UNIT - III (Minimum 8 Questions)		
1.	What are the differences between paging and segmentation?	**CO1- R**	**-**
2.	When does a page fault occur?	**CO1- U**	**-**
3.	Construct a Resource Allocation Graph for the following scenario. At time 't' Process P1 request for a resource X, process P2 requests for a resource Y. Both the resources are Available and they are allocated to the requesting process. At time t1 where t1>t2 both the processes are still holding the resources, however process P1 request for Y which is held by P2, process P2 request for X held by P1. Will there be a deadlock? if there is a deadlock discuss the four necessary conditions for deadlock, else justify there is no deadlock .	**CO2-AP**	**PO1**
4.	A computer system has 6 tape drives, with 'n' processes competing for them. Each process may need 3 tape drives. The maximum value of 'n' for which the system is guaranteed to be deadlock free Calculate the n value.	**CO2-AP**	**PO1**
5.	What are conditions under which a deadlock situation may arise?	**CO1- U**	**-**
6.	What are the methods for handling deadlocks?	**CO1- U**	**-**
7.	What are Swapping	**CO1- U**	**-**
8.	Define contagious memory allocation	**CO1- U**	**-**
	UNIT - IV (Minimum 8 Questions)		
1.	What is meant by Demand Paging	**CO1- R**	**-**
2.	Differentiate local and global page replacement algorithm. Differentiate local and global page replacement algorithm.	**CO1- U**	**-**
3.	What is virtual memory? Mention its advantages	**CO1- R**	**-**
4.	If the average page faults service time of 25 ms and a memory access time of 100ns.Calculate the effective access time.	**CO2-AP**	**PO1**
5.	What are the steps required to handle a page fault in demand paging?	**CO1- R**	**-**
6.	What are the various Disk-Scheduling Algorithms?	**CO1- R**	**-**
7.	Define Spooling.	**CO1- R**	**-**
8.	Why must the bit map for file allocation be kept on mass storage rather than in main memory?	**CO1- U**	**-**
	UNIT - V (Minimum 8 Questions)		

1.	What is the reason for using virtual machines instead of original hardware?		**CO1- U**	-	
2.	What are some common use cases for virtual machines?		**CO1- R**	-	
3.	Why virtualization is required?		**CO1- U**	-	
4.	What are some of the benefits and drawbacks of using virtual machines?		**CO1- R**	-	
5.	List the advantages of Virtualization.		**CO1- R**	-	
6.	What are the functions of virtual file system (VFS)?		**CO1- R**	-	
7.	Identify what virtual machine is and what are the advantages virtual machines.		**CO1- U**	-	
8.	List out names of mobile OS.		**CO1- R**	-	
	PART – C				
	UNIT - I (Minimum 5 Questions either or choice)				
1.	(a)	Describe the essential properties of the following types of Operating System and relate it with Real Time Examples a. batch b. Time Sharing c. Real Time d. Network e. Parallel f. Distributed g. Clustered h. Handheld	**CO1 U**	-	(16)
		Or			
	(b)	(i)What is a Process? Explain the Process Control Block and the various Process States	**CO1- U**	-	(8)
		(ii)Explain Process Creation and Process Termination	**CO1- U**	-	(8)
2.	(a)	How the processes cooperatively work in the system and discuss it?	**CO1 U**	-	(16)
		Or			
	(b)	How the operating systems ensure the hardware protection?	**CO1 U**	-	(16)
3.	(a)	Describe the system calls and system process with a real time example.	**CO1- U**	-	(8)
	(b)	In a multiprogramming and time-sharing environment, several users share the system simultaneously. This situation can result in various security problems. i) What are two such problems? ii) Can we ensure the same degree of security in a time-shared machine as in a dedicated machine? Explain your answer.	**CO1- U**	-	(8)
		Or			
	(b)	Explain about inter process communication	**CO1 U**	-	(16)
4.	(a)	List the services provided by an operating system. Explain how each provides convenience to the users. Explain also in which cases it would be impossible for user level programs to provide these services	**CO1 U**	-	(16)
		Or			
	(b)	Explain the inter process communication in detail	**CO1 U**	-	(16)

<table>
<tr><td>5.</td><td>(a)</td><td>What are the various components of operating system structure and explain the simple and layered approach of operating system in detail.</td><td>CO1 U</td><td>-</td><td>(16)</td></tr>
<tr><td></td><td></td><td>Or</td><td></td><td></td><td></td></tr>
<tr><td></td><td>(b)</td><td>How the processes cooperatively work in the system and discuss it?</td><td>CO1 U</td><td>-</td><td>(16)</td></tr>
<tr><td colspan="6">UNIT - II (Minimum 5 Questions either or choice)</td></tr>
<tr><td>1.</td><td>(a)</td><td>Consider a five Philosophers who spend their lives thinking and eating, when a philosopher thinks, she does not interact with her colleagues, she gets to hungry and tries to pick up the two chopstick that are closest that are closest to her. she may pick up only one chopstick at a time and she cannot pick up a chopstick that is already in the hand of a neighbor and eats without releasing her chopsticks provide a solution to this problem using semaphores</td><td>CO2-AP</td><td>PO1</td><td>(16)</td></tr>
<tr><td colspan="6">Or</td></tr>
<tr><td></td><td>(b)</td><td>For the following set of process find the average waiting time using Gantt chart for
i. SJF
ii. Priority scheduling process
Burst time Priority
p1 5 5
p2 3 4
p3 8 3
p4 2 1
p5 1 2
The process has arrived in the order p2, p1, p4, p3 and p5.
Which of the schedules in part a results in the minimal average waiting time?</td><td>CO2-AP</td><td>PO1</td><td>(16)</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>2.</td><td>(a)</td><td>Using semaphores, design a solution to manage clients access to five banking tellers given the following operation scenario: The bank has a space with 15 chairs and a standing area that can accommodate up to 10 clients. Hence, the maximum number of clients allowed to enter the bank branch is 25. A client needs to wait for an empty chair before sitting. A client will not be served except after receiving a ticket. To obtain a ticket, the client needs to enter his ID. When a teller is available, one.</td><td>CO2-AP</td><td>PO1</td><td>(16)</td></tr>
<tr><td colspan="6">Or</td></tr>
<tr><td></td><td>(b)</td><td>i) Evaluate FCFS,SJF CPU Scheduling algorithm for given Problem
ii) Round robin scheduling with CPU quantum of 2 time units.
<table>
<tr><td>Process</td><td>P1</td><td>P2</td><td>P3</td><td>P4</td></tr>
<tr><td>Burst Time</td><td>8</td><td>4</td><td>9</td><td>5</td></tr>
<tr><td>Arrival Time</td><td>0</td><td>1</td><td>2</td><td>3</td></tr>
</table></td><td>CO2-AP</td><td>PO1</td><td>(16)</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>3.</td><td>(a)</td><td>There are five philosophers sitting around a table, in which there are</td><td>CO2-AP</td><td></td><td></td></tr>
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		five chopsticks/forks kept beside them and a bowl of rice in the centre, When a philosopher wants to eat, he uses two chopsticks - one from their left and one from their right. When a philosopher wants to think, he keeps down both chopsticks at their original place. Provide a solution to this problem.		**PO1**	(16)
		Or			
	(b)	Consider the following set of processes, with the length of the CPU – burst time in given ms: Process Burst time (B.T) Arrival time(A.T) P1 8 0.00 P2 4 1.000 P3 9 2.001 P4 5 3.001 P5 3 4.001 Draw four Gantt charts illustrating the execution of these processes using FCFS, SJF, Priority and RR (quantum=2) scheduling. Also calculate waiting time and turnaround time for each scheduling algorithms.	**CO2-AP**	**PO1**	(16)
4.	(a)	A barbershop consists of a waiting room with n chairs and the barber room containing the barber chair. If there are no customers to be served the barber goes to sleep. If a customer's enters the barbershop and all the chairs are occupied, then the customers leaves the shop. If the barber is busy but chairs are available, then the customers sits in one of the free chairs if the barber is asleep, the customers wakes up the barber. write a structure to coordinate the barber and the customers	**CO2-AP**	**PO1**	(16)
		Or			
	(b)	Explain the FCFS, preemptive and non-preemptive versions of Shortest-Job First and Round Robin (time slice = 2) scheduling algorithms with Gantt charts for the four Processes given. Compare their average turnaround and waiting time. Process Arrival Time Waiting Time P1 0 8 P2 1 4 P3 2 9 P4 3 5	**CO2-AP**	**PO1**	(16)
5.	(a)	Consider a five Philosophers who spend their lives thinking and eating, when a philosopher thinks, she does not interact with her colleagues, she gets to hungry and tries to pick up the two chopstick that are closest that are closest to her. she may pick up only one chopstick at a time and she cannot pick up a chopstick that is already in the hand of a neighbor and eats without releasing her chopsticks provide a solution to this problem using semaphores.	**CO2-AP**	**PO1**	(16)
		Or			
	(b)	Consider the following set of processes with the length of the CPU burst time given in milliseconds	**CO2-AP**		

		Process Burst Time Priority P1 10 5 P2 1 1 P3 2 3 P4 1 4 P5 5 2 The processes are assumed to have arrived in the order p1,p2,p3,p4,p5. i.Draw four Gantt charts illustrating the execution of these processes using FCFS,SJF a non-preemptive priority scheduling, RR (time Quantum=1 ms) scheduling. ii. What is the average waiting time of each scheduling algorithms. iii.Which of the schedules in part a results in the minimal average waiting time?		**PO1**	(16)
		UNIT - III (Minimum 5 Questions either or choice)			
1.	(a)	Consider 5 processes P0 through P4; 3 resource types A(10 instances), B(5instances, and C(7 instances).Snapshot at time T0: Allocation A B C / Max A B C / Available A B C P0: 0 1 0 / 7 5 3 / 3 3 2 P1: 2 0 0 / 3 2 2 P2: 3 0 2 / 9 0 2 P3: 2 1 1 / 2 2 2 P4: 0 0 2 / 4 3 3 Answer the following questions using the banker's algorithm: a. What is the content of the matrix *Need*? Is the system in a safe state? b. If a request from process P1 arrives for (1,0,2), can the request be granted immediately? c. Can request for (3,3,0) by P4 be granted? d. Can request for (0,2,0) by P0 be granted?	**CO2-AP**	**PO1**	(16)
		Or			
	(b)	Given six memory partitions of 300 KB, 600 KB, 350 KB, 200 KB, 750 KB,and 125 KB (in order), how would the first-fit, best-fit, and worst-fit algorithms place processes of size 115 KB, 500 KB, 358 KB, 200 KB, and375 KB (in order)? Rank the algorithms in terms of how efficiently they use memory Most systems allow programs to allocate more memory to its address space during its execution. Data allocated in the heap segments of programs is an example of such allocated memory. What is required to support dynamic memory allocation in the following	**CO2-AP**	**PO1**	(16)

		scheme			
2.	(a)	Consider the following snapshot of a system: Process Allocation Max Available A B C D A B C D A B C D P0 0 0 1 2 0 0 1 2 1 5 2 0 P1 1 0 0 0 1 7 5 0 P2 1 3 5 4 2 3 5 6 P3 0 6 3 2 0 6 5 2 P4 0 0 1 4 0 6 5 6 Answer the following questions using the banker's algorithm: a. What is the content of the matrix *Need*? Is the system in a safe state? b. If a request from process P1 arrives for (0, 4, 2, 0), can the request be granted immediately?	**CO2-AP**	**PO1**	(16)
		Or			
	(b)	Consider 5 processes P0 through P4; 3 resource types A(10 instances), B(5instances, and C(7 instances).Snapshot at time T0: Allocation Max Available A B C A B C A B C P0 0 1 0 7 5 3 3 3 2 P1 2 0 0 3 2 2 P2 3 0 2 9 0 2 P3 2 1 1 2 2 2 P4 0 0 2 4 3 3 Answer the following questions using the banker's algorithm: a. What is the content of the matrix *Need*? Is the system in a safe state? b. If a request from process P1 arrives for (1,0,2), can the request be granted immediately? c. Can request for (3,3,0) by P4 be granted? d. Can request for (0,2,0) by P0 be granted?	**CO2-AP**	**PO1**	(16)
3.	(a)	Consider the following snapshot of a system: Process Allocation Max Available A B C D A B C D A B C D P0 2 0 0 1 4 2 1 2 3 3 2 1 P1 3 1 2 1 5 2 5 2 P2 2 1 0 3 2 3 1 6 P3 1 3 1 2 1 4 2 4 P4 1 4 3 2 3 6 6 5 Answer the following questions using the banker's algorithm:	**CO2-AP**	**PO1**	(16)

		a. What is the content of the matrix Need? b. Is the system in a safe state? If a request from process P1 arrives for (1, 1, 0, 0), can the request be granted immediately?			
		Or			
	(b)	Given six memory partitions of 300 KB, 600 KB, 350 KB, 200 KB, 750 KB,and 125 KB (in order), how would the first-fit, best-fit, and worst-fit algorithms place processes of size 115 KB, 500 KB, 358 KB, 200 KB, and375 KB (in order)? Rank the algorithms in terms of how efficiently they use memory Most systems allow programs to allocate more memory to its [illegible] of programs a [illegible] such allocated memory. What is required to support dynamic memory allocation in the following scheme	**CO2-AP**	**PO1**	(16)
4.	(a)	Consider the following system snapshot using data structures in the banker's algorithm, with resources A, B, C and D and process P0 to P4. Max Allocation Need Available A B C D A B C D A B C D A B C D P0 6 0 1 2 4 0 0 1 3 2 1 1 P1 1 7 5 0 1 1 0 0 P2 2 3 5 6 1 2 5 4 P3 1 6 5 3 0 6 3 3 P4 1 6 5 6 0 2 1 2 Using banker's algorithm, Answer the following questions: a) How many resources of type A, B, C and D are there? (2) b) What are the contents of the need matrix? (3) c) Is the system in a safe state? Why? (3)	**CO2-AP**	**PO1**	(16)
		Or			
	(b)	Free memory holes of sizes 15K, 10K, 5K, 25K, 30K, 40K are available. The processes of size 12K, 2K, 25K, 20K is to be allocated. How processes are placed in first fit, best fit, worst fit. Calculate internal as well as external fragmentation. What is the size of the physical address space in a paging system which has a page table containing 64 entries of 11 bits including valid / invalid bit and a page size of 512 bytes?	**CO2-AP**	**PO1**	(16)
5.	(a)	Compare the segmented paging scheme with the hashed page table scheme for handling large address spaces. Under what circumstances is one scheme preferable to the other?			
		Or			
	(b)	A system has three types of resources R1 R2 R3 and their number of units are 3, 2, 2 respectively. Four processes P1 P2 P3 P4 are currently competing for these resources in following number. 1. P1 is holding one unit of R1 and is requesting for one unit of R2.	**CO2-AP**		

		2. P2 is holding two units of R2 and is requesting for one unit each of R1 and R3. 3. P3 is holding one unit of R1 and is requesting for one unit of R2. 4. P4 is holding two units of R3 and requesting for one unit of R1. Determine which if any of the processes are deadlock in this state		**PO1**	(16)
		UNIT-IV			
1.	(a)	currently serving a request at cylinder 143 and previous request was at cylinder 125 .The queue of pending request in FIFO order is: 86, 147, 312, 91, 177, 48, 309, 222, 175, 130. Starting from the current head position what is the total distance in cylinders that the disk to satisfy all the pending request for each of the following disk scheduling algorithms? 1) SSTS 2) SCAN 3) C-SCAN	**CO2-AP**	**PO1**	(16)
		Or			
	(b)	Consider the following page reference string. 1,2,3,4,5,3,4,1,6,7,8,7,8,9,7,8,9,5,4,5,4,2 How many page faults would occur for the following replacement algorithm, assuming four and six frames respectively? a. LRU page replacement. b. FIFO page replacement c. optimal page replacement	**CO2-AP**	**PO1**	(16)
2.	(a)	Consider a disk with 200 tracks and the queue has random requests from different processes in the order: 55, 58, 39, 18, 90, 160, 150, 38, 184 Initially arm is at 100. Find the Average Seek length using FIFO,SSTF, SCAN and C-SCAN algorithm	**CO2-AP**	**PO1**	(16)
		Or			
	(b)	Consider the following page reference string 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1 How many page faults would occur for the following replacement algorithms, assuming three frames that all frames are initially empty? a. LRU page replacement. b. FIFO page replacement c. Optimal page replacement	**CO2-AP**	**PO1**	(16)
3.	(a)	Consider that a disk drive has 5,000 cylinders, numbered 0 to 4,999.The drive is currently serving request at cylinder 143, and the previous request was at cylinder 125. The queue of pending requests, in FIFO order, is: 86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130 Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all pending requests for each of the following disk scheduling algorithms? A. FCFS B. SSTF C. SCAN D. C-SCAN	**CO2-AP**	**PO1**	(16)
		Or			

	(b)	Consider the Pages referenced by the CPU in the order are 6, 7, 8, 9, 6, 7, 1, 6, 7, 8, 9, 1 How many page faults would occur for the following replacement algorithm, assuming four and six frames respectively? a. LRU page replacement. b. FIFO page replacement c. optimal page replacement	**CO2-AP**	**PO1**	(16)
4.	(a)	Explain an organization of I/O functions with neat sketch.	**CO1-U**	**-**	(16)
		Or			
	(b)	Explain n OS design issues in detail.	**CO1-U**	**-**	(16)
5.	(a)	Consider a disk with 200 tracks and the queue has random requests from different processes in the order: 55, 58, 39, 18, 90, 160, 150, 38, 184 Initially arm is at 100. Find the Average Seek length using FIFO,SSTF, SCAN and C-SCAN algorithm	**CO2-AP**	**PO1**	(16)
	(b)	Consider the following page reference string. 1,2,3,4,5,3,4,1,6,7,8,7,8,9,7,8,9,5,4,5,4,2 How many page faults would occur for the following replacement algorithm, assuming four and six frames respectively? a. LRU page replacement. b. FIFO page replacement c. optimal page replacement	**CO2-AP**	**PO1**	(16)
		UNIT-V			
1.	(a)	Discuss about the evolution of virtual machines.Also explain how virtualization could be implemented in operating systems.	**CO1-U**	**-**	(16)
		Or			
	(b)	Explain about Linux kernel and virtualization with neat sketch	**CO1-U**	**-**	(16)
2.	(a)	Your company has multiple departments with different software requirements, and you need to provide them with access to a centralized pool of virtual machines. How would you go about setting up and managing these virtual machines?	**CO2-AP**	**PO1**	(16)
		Or			
	(b)	You're an IT manager at a company that allows employees to use their own smartphones for work purposes. How can you ensure that the company's data remains secure on these devices, and what features of mobile operating systems can help you achieve this?	**CO2-AP**	**PO1**	(16)
3.	(a)	Why can VMMs not implement trap-and-emulate-based virtualization on some CPUs? Lacking the ability to trap-and-emulate, what method can a VMM use to implement virtualization	**CO1-U**	**-**	(16)

		Or			
	(b)	Discuss about the evolution of virtual machines.Also explain how virtualization could be implemented in operating systems.	**CO1-U**	**-**	(16)
4.	(a)	Your company has multiple departments with different software requirements, and you need to provide them with access to a centralized pool of virtual machines. How would you go about setting up and managing these virtual machines?	**CO2-AP**	**PO1**	(16)
		Or			
	(b)	Your business has experienced rapid growth and needs to add more servers to your infrastructure quickly and cost-effectively. How can virtual machines help you achieve this, and what are some best practices for managing and scaling virtual machines in a business environment?	**CO2-AP**	**PO1**	(16)
5.	(a)	You're a user who's lost your phone, and you need to remotely wipe all of the data on the device to protect your personal information. How can you do this using the built-in features of your mobile operating system, and what steps should you take to ensure that your data is completely erased?	**CO2-AP**	**PO1**	(16)
		Or			
	(b)	You're an IT manager at a company that allows employees to use their own smartphones for work purposes. How can you ensure that the company's data remains secure on these devices, and what features of mobile operating systems can help you achieve this?	**CO2-AP**	**PO1**	(16)