Roll Number: _____

Thapar Institute of Engineering & Technology, Patiala

Department of Computer Science & Engineering

Operating Systems (UCS303): End Semester Test

Faculty Name: Garima Singh ***Date & Time: 17/05/2024 at 9am***

Maximum Marks: 40 ***Maximum Time: 3 Hrs***

Note: *Attempt any five questions and each sub-part like (a), (b), (c) for each question at one place. Do mention Page No. of your attempt at front page of the answer sheet. Assume missing data (if any). Show all intermediate computations properly*

Q No	Questions	Marks	CO	BL
1.	a) Describe various techniques used for Free-Space Management.	2.5	CO4	L1
	b) Explain how operating system ensures access control using access matrix, also explain copy, owner and control rights of it.	2.5	CO4	L2
	c) Suppose the following disk request sequence (track numbers) for a disk with 100 tracks is given: 45,20, 90, 10, 50, 60, 80, 25, 70. Assume that the initial position of the R/W head is on track 50. Find outthe additional distance that will be traversed by the R/W head when the Shortest Seek Time First (SSTF) algorithm is used compared to the C-Look algorithm (assuming that R/W head moves towards 100 when it starts execution).	3	CO4	L4
2	a) Explain reader-writer problem and provide its solution using semaphore.	2.5	CO5	L2
	b) Consider a non-negative counting semaphore S. The operation P(S) decrements S, and V(S) increments S. During an execution, 20 P(S) operations and 12 V(S) operations are issued in some order. Find out the largest initial value of S for which at least one P(S) operation will remain blocked.	2.5	CO5	L3
	c) Discuss two techniques that can be used to handle situations where the page table size becomes morethan the page size. Consider a computer system with a 32-bit virtual address space and a page size of4 KB. The system uses a single-level page table for virtual to physical address translation. Each page table entry (PTE) requires 4 bytes. Find out the size of page table.	3	CO3	L3
3	a) How OS handles programs to be executed even if they do not fit entirely into physical memory. Explain the concept of page faults and how the operating system handles them.	2	CO3	L2
	b) A system uses 3 page frames for storing process pages in main memory. Assume that all the page frames are initially empty. What is the total number of page faults that will occur while processing the page reference string: 4, 7, 6, 1, 7, 6, 1, 2, 7, 2. Also calculate the hit ratio and miss ratio for following schemes? i) LRU ii) Optimal Page Replacement iii) Second chance algorithm	3	CO3	L3
	c) Explain what a Translation Lookaside Buffer (TLB) is and its role in a paging system. A paging scheme uses a Translation Lookaside buffer (TLB). The effective memory access takes 160 ns and amain memory access takes 100 ns. What is the TLB access time (in ns) if the TLB hit ratio is 60% and there is no page fault?	3	CO3	L2

4	a) Consider a system having m resources of the same type. These resources are shared by 3 processes A,B and C which have peak demands of 3, 4 and 6 respectively. For what value of m, deadlock will notoccur?	2	CO2	L4
	b) Consider a system with three types of resources (R1, R2, and R3) and four processes (P1, P2, P3, andP4). The current state of the system is represented by the following Resource Allocation Graph (RAG): P1 is holding 1 unit of R1 and is requesting 1 unit of R2, P2 is holding 2 units of R2 and is requesting 1 unit of R3, P3 is holding 1 unit of R3 and is requesting 1 unit of R1 and P4 is holding 1 unit of R1 and 1 unit of R3. Draw the Resource Allocation Graph (RAG) for the given scenario. Determine if there is a deadlock.	2	CO2	L3

	c) Explain wait() system call and find out output of following code with decision tree:
	int main(){
	if (fork() && (!fork())) {if (fork()) {
	fork();} }
	printf("EST
	");return 0; }
		4	CO1	L4

5	a) Explain significance of RAID (Redundant Array of Independent Disks) in a system, and explain various RAID levels with their advantages and disadvantages?	2	CO4	L2
	b) Consider the set of 5 processes whose arrival time and burst time are given below Process Id / Arrival Time / Burst Time / Priority P1 / 0 / 4 / 2 P2 / 1 / 3 / 3 P3 / 2 / 1 / 4 P4 / 3 / 5 / 5 P5 / 4 / 2 / 5 Calculate the average waiting time and average turnaround time, using the preemptive priority scheduling and round robin algorithm (higher number represents higher priority and time quantum is 3-time unit).	4	CO2	L3
	c) Explain Process Control Block (PCB).	2	CO2	L2
6	a) Consider five memory partitions of size 100 KB, 500 KB, 200 KB, 450 KB and 600 KB in same order. If sequence of requests for blocks of size 212 KB, 417 KB, 112 KB and 426 KB in same order come, then which fixed size partition allocation algorithm makes the efficient use of memory?	2	CO3	L5
	b) Explain following: i. Thrashing ii. Race Condition iii. Aging	3		
	c) Explain disk structure with a suitable diagram. Consider a 512 GB hard disk with 32 storage surfaces. There are 4096 sectors per track and each sector holds 1024 bytes of data. Find out the number of cylinders present on the hard disk.	3	CO3+CO5+CO2 CO4	L2 L3

Marks Distribution