R V College of Engineering
Department of Computer Science and Engineering
CIE - I: Question Paper

Subject : (Code)	OPERATING SYSTEMS (CS235A1)		Semester : 3rd B.E
Date : .01.2024	Duration : 90 minutes	Staff : Dr. PH, Dr. JS, Prof. AUC, Dr. MM, Prof. Neethu, Prof. Merin M	
Name :	USN :	Section :	A/B/C/D/CD/CY/ISE

Sl.no	Part-A	Marks	* L1-L6	*CO
1	Illustrate with help of a neat diagrams the different approaches to design an operating system.	10	L2	CO1
2	Write a code segment in C where a parent process forks three child processes. Each child process prints a welcome message "I AM A NEW CHILD", waits for delay of 10 seconds, and then terminates. The parent process will check the termination status of the child processes, and print messages like "CHILD WITH PID *** TERMINATED", before finally printing the message "PARENT PROCESS EXITING ...".	10	L3	CO4
3a	Consider the following set of processes. Calculate the average waiting time and average turnaround time for the following scheduling algorithms: (i) FCFS, (ii) non-preemptive SJF, (iii) pre-emptive SJF, and (iv) round-robin with time quantum of 3 msec.	8	L3	CO3
3b	State four events that may lead to process context switch in a time sharing operating system.	2	L1	CO
4 a.	Describe Amdahl's Law in the context of speedup within multithreaded programming. Suppose we have a program with 80% of the code that can be parallelized, and 20% that must be executed sequentially. If we use 5 threads for parallel execution, what is the potential speedup?	6	L3	CO
4b	Justify with reasons which of the following is a privileged instruction • Switch from user mode to supervisor mode. • Initialize the timer value in round-robin scheduling.	4	L2	

Process	P1	P2	P3	P4	P5	P6
Arrival Time (msec)	0	2	3	5	6	8
CPU Burst (msec)	7	4	6	2	8	5

5a.	Justify or contradict the following: i. The primary objective of multiprogramming is to minimize user response time, while the primary objective of time sharing is to maximize processor utilization. ii. Thread scheduling faster than process scheduling. iii. Shortest Job First (SJF) scheduling does not always guarantee the minimum waiting time.	7	L2	CO2
5b.	Clearly explain the differences between the following with the help of examples: (i) System call, (ii) an exception, (iii) an Internal hardware interrupt.	3	L2	CO1

	L1	L2	L3	L4	L5	L6	CO1	CO2	CO3	CO4	CO5
Total Marks	2	24	24	--	--	--	15	11	14	10	--

COURSE OUTCOMES:

Course Outcomes: After completing the course, the students will be able to	
CO 1	Demonstrate the fundamental concepts of operating system like process management, file management, memory management and issues of synchronization.
CO 2	Analyze and interpret operating system concepts to acquire a detailed understanding of the course.
CO 3	Apply the operating systems concepts to address related new problems in computer science domain.
CO 4	Design or develop solutions using modern tools to solve applicable problems in operating systems domain.
CO 5	Extend the theoretical knowledge acquired through the course to demonstrate skills like investigation, effective communication, working in team/Individual, following ethical practices by implementing operating system concepts/applications and engage in lifelong learning.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Date	Feb. 2024	Maximum Marks	50
Course Code	CS235AI	Duration	90Min
Sem	III	CIE - II	

OPERATING SYSTEMS

SL No.	Part B - Test	M	BT	CO
1a.	Spinlocks are not appropriate for uniprocessor systems and are suitable for multiprocessor systems. Examine this statement	4	L4	CO2
1b.	Discuss different types of semaphores with suitable example.	6	L3	CO4
2.a	Write a pseudo code to implement critical section solution using TestAndSet() hardware instructions.	5	L2	CO4
2.b	Describe the key features of Peterson's Solution and how it addresses the Critical Section problem.	5	L2	CO3
3.a	With the help of a neat diagram explain the basic paging scheme of memory management also discuss the hardware support for paging..	7	L2	CO2
3.b	Suppose that we have free segments with sizes: 8, 19, 27, 16, and 21. Place a program with size 15kB in the free segment using first-fit, best-fit and worst fit?	3	L3	CO3
4a.	Consider a user program of logical address of size 6 pages and page size is 4 bytes. The physical address contains 300 frames. The user program consists of 22 instructions a, b, c, . . . u, v . Each instruction takes 1 byte. Assume at that time the free frames are 7, 26, 52, 20, 55, 6, 18, 21, 70, and 90. Find the following? (10 degrees) A) Draw the logical and physical maps and page tables? B) Allocate each page in the corresponding frame? C) Find the physical addresses for the instructions m, d, v, r?	07	L3	CO5
4b.	Compare external and internal fragmentation with an example. List any one solution to external and internal fragmentation.	3	L2	CO4

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5a.	Consider a paging system with the page table stored in memory. a. If a memory reference takes 200 nanoseconds, how long does a paged memory reference take? b. If we add TLBs, and 75 present of all page-table references are found in the TLBs, what is the effective memory reference time? (Assume that finding a page-table entry in the TLBs takes zero time, if the entry is there.)	4	L4	CO5
5b.	Write down any two differences between following: a) Logical and physical address? b) Page table and segment table? d) Contiguous and non-contiguous memory allocation	6	L2	CO2

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CO1	CO2	CO3	CO4	CO5	L1	L2	L3	L4
0	17	8	14	11	0	26	16	8

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Mysore Road, RV Vidyaniketan Post,
Bengaluru - 560059, Karnataka, India

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hod.cse@rvce.edu.in
www.rvce.edu.in
Tel: 080-68188199

Department of Computer Science and Engineering

Operating Systems

Date	March, 2024	Maximum Marks	50
Course Code	CS235AI	Duration	90 Min
Sem	III	CIE – III	

SL No.	Test Questions	M	BT	CO
1.a	List and explain the attributes associated with a file.	7	1	3
1.b	Given in a system with 56 frames, if there is a process of 9KB and another process of 96KB,calculate the number of frames that would be allocated to process 1 and process 2 using proportional allocation.	3	4	3
2.a	With a neat diagram, list the steps in handling page fault?	7	2	2
2.b	List the advantages of Virtual Memory?	3	1	2
3.a	List and explain the different files systems supported by Virtual File Systems.	7	4	4
3.b	What will be the EAT if hit ratio is 70%, time for TLB is 30ns and access to main memory is 90ns?	3	4	2
4.a	List the steps of Basic page replacement scheme.	5	1	2
4.b	Briefly explain second chance and enhanced second chance algorithm.	5	2	2
5.a	Consider reference strings 3, 2, 1, 0, 3, 2, 4, 3, 2, 1, 0, 4, and 3 slots, With FIFO replacement algorithm calculate the number of faults and also increase slots to 4, and find out the number of faults , Check whether Belady's anamoly exists in this case.	7	4	3
5.b	List all the operations that can be performed on a file.	3	2	2

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BT-Blooms Taxonomy, CO-Course Outcomes, M-Marks

Marks Distribution	Particulars		CO1	CO2	CO3	CO4	L1	L2	L3	L4	L5	L6
	Test	Max Marks	--	26	17	7	15	15	--	20		

(Autonomous Institution Affiliated to VTU)
III Semester B. E. Examinations Apr/May-2024

OPERATING SYSTEMS

Common to CSE/ISE/CD/CY

Time: 03 Hours *Maximum Marks: 100*

Instructions to candidates:

1. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
2. Answer FIVE full questions from Part B. In Part B question number 2 is compulsory. Answer any one full question from 3 and 4, 5 and 6, 7 and 8, 9 and 10.

PART-A

			M	BT	CO
1	1.1	To access the service of the operating system, the interface is provided by the _____.	01	2	1
	1.2	If a process fails, most operating system write the error information to a _____.	01	3	2
	1.3	Discuss the term 'busy waiting' with respect to synchronization.	02	2	1
	1.4	The operating system maintains a _____ table that keeps track of how many frames have been allocated, and how many are available.	01	1	2
	1.5	List any two differences between paging and segmentation in memory management schemes.	02	1	1
	1.6	To obtain better memory utilization, a routine is not loaded until it is called – this is often referred to as _____.	01	2	1
	1.7	The operating system keeps a small table containing information about all open files called _____.	01	2	1
	1.8	State 50-percent rule, with respect to contiguous memory allocation strategies.	02	3	3
	1.9	Which module gives control of the *CPU* to the process selected by the short-term scheduler?	01	3	3
	1.10	Consider the following set of processes, the length of the *CPU* burst time give in milliseconds. Assuming the process are being scheduled with the *SJF* scheduling algorithm. What is the waiting time for process *P1*.			

Process	*Burst Time*
P1	6
P2	8
P3	7
P4	3

	1.11	The data structure used for file directory is called _____.	02	4	4
	1.12	Identify what information is contained in a file control block.	01	1	2
	1.13	The algorithm in which we split m frames among n processes, to give everyone an equal share, m/n frames is referred as _____.	02	2	2
	1.14	Consider the methods used by processes *P1* and*P2* for accessing their critical section whenever needed, as given below. The initial values of shared boolean variables *S1* and *S2* are randomly assigned. Identify what properties of critical section problem are addressed in the above scenario.	01	2	4

		Method used by P1 : *while (S1 == S2);* *Critical section* *S1 = S2;* *Method used by P2 :* *while (S1! = S2);* *Critical section* *S2 = not(S1);*	02	4	4

PART-B

2	a	With a suitable diagram, discuss the various operating system services with respect to the user not for the system respectively.	08	2	2
	b	Discuss Process control block. With a neat diagram explain the process and the various states of the process.	08	2	2
3	a	Distinguish between Preemptive and Non Preemptive scheduling approach.	04	2	1
	b	Briefly explain the different types of multithreaded models.	06	1	1
	c	Implement a simple Pthread program to print *"NEW YEAR GREETINGS, CSE – RVCE"* on to the console.	05	4	4
		OR			
4	a	Identity and discuss briefly the challenges in programming for multicore systems.	06	3	4
	b	Consider the set of 5 processes whose arrival time and burst time are given below table. If the *CPU* scheduling policy is Round Robin with time quantum – 2 unit, calculate the average waiting time and average turnaround time.	10	4	4

Process	*Arrival Time(msec)*	*Burst Time(msec)*
P1	0	5
P2	1	3
P3	2	1
P4	3	2
P5	4	3

5	a	What is meant by critical section problem? Give its general structure. Explain the requirements that must be satisfied by a solution to the critical section problem.	08	2	1
	b	Discuss the classical readers-writers synchronization problem and write a pseudo code using semaphores.	08	3	4
		OR			
6	a	Explain the limitations of semaphores with suitable example to illustrate the same.	04	3	3
	b	Apply hardware instruction TestAndSet to implement a solution that adheres to all the requirements of a critical section problem.	04	3	4
	c	With a neat diagram discuss the dining philosopher's problem. Explain the significance of this problem to computers. Write pseudocode for the structure of philosopher *'I'* using semaphores.	08	4	4

7	a	What is a translation lookaside buffers? Describe simple paging system with a suitable diagram for paging hardware with *TLB*.	08	2	2
	b	Consider the following page reference stream 4, 7, 6, 1, 7, 6, 1, 2, 7, 2 How many page faults would occur for *LRU*, *FIFO* and Optimal replacement algorithms, assuming 3 pages frames. Discuss the issue with *FIFO* replacement algorithm.	08	4	4
		OR			
8	a	Illustrate how demand paging affects system performance.	04	2	2
	b	Consider a logical address space of 8 pages of 1024 words each mapped onto a physical memory 32 frame. How many bits are there in logical and physical address?	04	4	4
	c	With an appropriate diagram discuss the approach of segmentation.	08	2	2
9	a	Discuss the fundamental ways of accessing a file.	08	2	2
	b	With a schematic view of a virtual file system, discuss the basic functionality of *VFS* implementation.	08	2	2
		OR			
10	a	Discuss the most common way of structuring directories.	10	2	2
	b	Define metadata. Discuss any four most common system calls relating to files operation.	06	2	2