RV INSTITUTIONS	**R V College of Engineering** **Department of Computer Science and Engineering** **CIE - I: Question Paper**		
Subject : (Code)	**OPERATING SYSTEMS (18CS34)**	**Semester : 3rd B.E**	
Date : .11.2021	**Duration :** 90 minutes	**Staff : Prof. JS, Dr. SANS, Dr. AN**	
Name :	**USN :**	**Section :**	**A/B/C**

Sl.no	Part-A	Marks	* L1-L6	*CO
1a.	Exemplify how the advances in digital technologies are attributed to different classes of operating system.	4	L2	CO2
1b.	Write a program to implement following : A parent process to spawn N children, where N is read from user as a command line argument. Each child should print message "Hi from child PID", where PID is the process ID of the child created. The parent process should wait for all the child to exit first.	6	L3	CO4
2	Write a program to create threads to perform following functions on an array simultaneously i) sort an array in ascending order ii) sort an array in descending i) reverse elements of array	10	L3	CO4
3	Consider the following set of processes with a length of the CPU burst time given in milliseconds	10	L4	CO3

Process	Arrival Time	Burst Time	Priority
P1	0	11	2
P2	5	28	0
P3	12	2	3
P4	2	10	1
P5	9	16	4

Draw Gantt charts illustrating the execution of these processes using Preemptive SJF, Preemptive Priority and Round Robin(Time slice=2ms). Compute the average waiting time, average turn around time and number of context switches in each approach.

Sl.no		Marks	L1-L6	CO
4 a.	With the help of a neat diagram explain the memory map of a process. Identify the memory region allocated for the variables var1, var2, var3, var4 and var5 in following program.	7	L4	CO3

```
int var1 = 10, var2;
int main()
{
        int  var3 = 5;
```

	`static int var4= 20` `int * var5 = malloc(sizeof(int) * 5);` `return 0;` `}`			
4b	Briefly describe scenarios for following process state transitions • Running=>waiting • Running => ready • New=>Ready	3	L2	CO2
5a.	Exemplify user mode and kernel mode of operation. Also show how linux kernel handles the system calls with help of an example and a neat diagram.	5	L2	CO2
5b.	With the help of a neat diagram differentiate i) a process and a thread ii) user thread and kernel thread.	5	L2	CO2

	L1	L2	L3	L4	L5	L6	CO1	CO2	CO3	CO4
Total Marks	--	17	16	17	-	-	-	17	17	16

COURSE OUTCOMES:

Course Outcomes: After completing the course, the students will be able to	
CO1:	Describe the fundamental computer concepts and syntax of C programming.
CO2:	Apply logical skills to design and develop algorithms/flow charts to solve real-world problems.
CO3:	Analyze the logic of the program and output obtained using different sets of input.
CO4:	Design and develop programs using appropriate data structures and functions in C language.

RV INSTITUTIONS	**R V College of Engineering** **Department of Computer Science and Engineering** **CIE - II: Question Paper**	
Subject : (Code)	**OPERATING SYSTEM (18CS34)**	**Semester : III B.E**

Date : 04.01.2022	**Duration :** 110 minutes	**Staff : Prof. JS/ Dr. SANS/ Dr.AN**
Name :	**USN :**	**Section : A/B/C**

Sl.no	Part-A	Marks	*L1-L6	*CO
1.	The following two functions P1 and P2 that share a variable B with an initial value of 2 execute concurrently. P1() { C = B – 1; = 1 B = 2 * C; B = 2 } P2() { D = 2 * B; = 4 B = D - 1; = 3 } How many distinct values B can possibly take after the execution?	1	L2	CO2
2.	Enumerate the advantages of spinlocks	2	L1	CO1
3.	Differentiate between external and internal fragmentation	2	L2	CO1
4.	At a particular time of computation the value of a counting semaphore is 7. Then 20 P operations and 15 V operations were completed on this semaphore. The resulting value of the semaphore is:	1	L2	CO2
5.	What is compaction?	2	L1	CO1
6.	In a paged memory, the page hit ratio is 0.35. The time required to access a page in secondary memory is equal to 100 ns. The time required to access a page in primary memory is 10 ns. Compute the average time required to access a page.	2	L2	CO3
	PART-B			
1.a	Illustrate the basic synchronization primitives test_and_set and compare_and_swap instructions	05	L2	CO3
1.b	Analyze the significance of paging hardware with Translation Look Aside Buffer (TLB)	05	L1	CO1
2.a	Identify the requirements of a critical section and illustrate Peterson's solution to the critical section problem	05	L2	CO1

2.b	Illustrate how demand paging is used to implement virtual memory	05	L2	CO2
3.a	Illustrate the step by step procedure for handling a page fault with a supporting diagram	06	L3	CO2
3.b	Write the code for the structure of a reader process of First-Readers Writers Problem using semaphores.	04	L3	CO4
4.	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 page replacement algorithms assuming 3 frames? All frames are initially empty. i. LRU ii. FCFS iii. Optimal Which algorithm is the most efficient?	10	L3	CO3
5.	Write a C program to implement the solution to Dining philosopher problem using semaphores	10	L4	CO4

	L1	L2	L3	L4	L5	L6	CO1	CO2	CO3	CO4
Total Marks	09	21	20	10	-	-	16	17	17	14

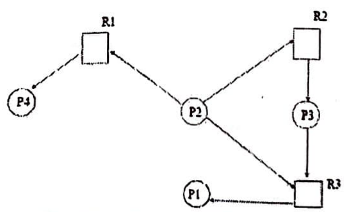
COURSE OUTCOMES:

Course Outcomes: After completing the course, the students will be able to	
CO1:	Understand and explore the fundamental concepts of various operating system services.
CO2:	Analyze and interpret operating system concepts to acquire a detailed understanding of the course.
CO3:	Apply the operating system concepts to address related new problems in computer science domain.
CO4:	Design or develop solutions to solve applicable problems in computer science domain

250

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

Subject : (Code)	OPERATING SYSTEMS(18CS34)	Semester :	III[rd] B.E
Date :.03.2022	Duration : 100 minutes	Staff :Prof. JS, Dr. SANS, Dr. AN	
Name :	USN :	Section :	A, B, C

Sl.no	Part-A	Marks	*L1-L6	*CO
1.1	Define Local replacement algorithm.	01	L2	CO1
1.2	If the total number of available frames is 50, and there are 2 processes one of 10 pages and the other of 5 pages then how much memory would be proportionally allocated to each of the processes?	02	L3	CO3
1.3	Define the terms logical and physical address space.	02	L2	CO1
1.4	List two examples of deadlocks that are not related to a computer system environment.	02	L1	CO2
1.5	Is it possible to have a deadlock involving only one single-threaded process? Explain your answer	02	L2	CO2
1.6	The additional time for the disk to rotate the desired sector to the disk head is referred to as ____________.	01	L1	CO1
	Part-B			
2.	Explain the variants of LRU Approximation Page Replacement Algorithm.	10	L2	CO1
3.	Consider a disk queue with requests for I/O to blocks on cylinders 98, 183, 41, 122, 14, 124, 65, 67. The head is initially at cylinder number 53 and moving towards larger cylinder numbers. The cylinders are numbered from 0 to 199. Determine the total head movement incurred while servicing these requests for FCFS, SSTF, SCAN and C-LOOK scheduling algorithms.	10	L4	CO3
4a.	Explain wait-for graph. Construct the wait-for graph that corresponds to the following resource allocation graph and state whether or not there is deadlock. 	05	L3	CO3

4b.	Discuss how the problems of contiguous file allocation can be overcome with linked allocation with a neat diagram.	05	L3	CO3
5.	List and explain the mechanisms employed to deal with index block with respect to file allocation.	10	L2	CO1
6.	Consider the following snapshot of a system: Allocation / Max / Available (A B C D) P_0: 0 0 1 2 / 0 0 1 2 / 1 5 2 0 P_1: 1 0 0 0 / 1 7 5 0 P_2: 1 3 5 4 / 2 3 5 6 P_3: 0 6 3 2 / 0 6 5 2 P_4: 0 0 1 4 / 0 6 5 6 Employ banker's algorithm and determine for the following cases a. What is the content of the matrix Need? b. Is the system in a safe state? c. If a request from process P1 arrives for (0,4,2,0), can the request be granted immediately?	10	L4	CO4

	L1	L2	L3	L4	L5	L6	CO1	CO2	CO3	CO4
Total Marks	03	25	12	20	--	--	24	04	22	10

COURSE OUTCOMES:

Course Outcomes: After completing the course, the students will be able to	
CO1:	Understand and explore the fundamental concepts of various operating system services.
CO2:	Analyze and interpret operating system concepts to acquire a detailed understanding of the course.
CO3:	Apply the operating systems concepts to address related new problems in computer science domain
CO4:	Design or develop solutions to solve applicable problems in operating systems domain.

18CS34

USN 1RV20CS142

RV COLLEGE OF ENGINEERING®
(An Autonomous Institution affiliated to VTU)
III Semester B. E. Examinations April - 2022
Computer Science and Engineering
OPERATING SYSTEMS

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, 7 and 8 are compulsory. Answer any one full question from 3 and 4 & one full question from 5 and 6

PART-A

1	1.1	In which of the multithreading model, the entire process does not block when a thread makes blocking system call?	01
	1.2	Kernel mode is also known as ____________.	01
	1.3	What are used by microkernels for communication?	01
	1.4	What is the name of the technique in which the operating system of a computer continues to work even in presence of failures?	01
	1.5	What type of process is a web server?	01
	1.6	Name the Unix command used to check process status?	01
	1.7	List the advantages of Spinlocks.	01
	1.8	What will happen if a non-recursive mutex is locked more than once?	01
	1.9	If the hit ratio to a TLB is 80%, and it takes 15 nanoseconds to search the TLB, and 150 nanoseconds to access the main memory, then what must be the effective memory access time in nanoseconds?	01
	1.10	Consider a system has 3 processes P1, P2 and P3. Process P1 needs 5 units of resource R; Process P2 needs 15 units of resource R and Process P3 needs 20 units of resource R. What is the maximum unit of resource R that can lead to deadlock?	01
	1.11	Consider we have the following reference string: 5, 0, 4, 4, 0, 3, 0, 4, 1, 0, 2, 0, 5, 3, 0, 4. Find the page fault of virtual memory using LRU algorithm and FIFO, where we used 4 frames?	02
	1.12	Suppose a process requests 12KB of memory and memory manager currently has a list of unallocated blocks of 6KB, 14KB, 19KB and 13KB blocks. Identify the block allocated by best fit, first fit, and worst fit strategy.	02
	1.13	Consider three CPU-intensive processes, which require 10, 20 and 30 time units and arrive at times 0, 2, and 6 respectively. How many context switches are needed if the operating system implements a shortest remaining time first scheduling algorithm? Do not count the context switches at time zero and at the end.	02

	1.14	Construct a wait-for-graph for resource allocation graph in Fig. 1.14 and determine if there exists a deadlock.

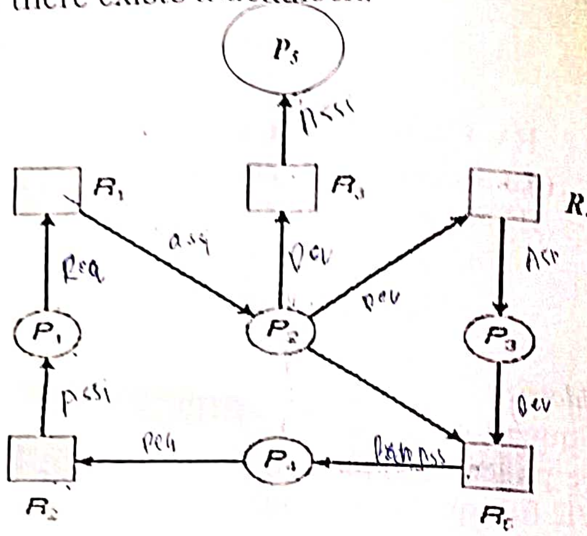


Fig. 1.14

	1.15	In a paged memory, the page hit ratio is 0.35. The time required to access a page in secondary memory is equal to 100ns. The time required to access a page in primary memory is 10ns. What is the average time required to access a page?

PART-B

2	a	List the approaches to design operating system structure, explain any one in detail.
	b	With a neat diagram illustrate process transition diagram.
	c	Differentiate between user threads and kernel threads.

3	a	An operating system uses Shortest Remaining Time First (SRTF) process scheduling algorithm. Consider the arrival times and execution times for the following processes:

Process	Execution Time	Arrival Time
P1	20	0
P2	25	15
P3	10	30
P4	15	45

Draw Gantt chart and calculate waiting time, turnaround time, average waiting time and average turnaround time for the processes.

	b	Illustrate Critical Section Problems with necessary conditions.
	c	Justify the need of semaphore for process synchronization. Further, giving definition for semaphore, illustrate implementation of counting semaphore using binary semaphore.

OR

4	a	Illustrate the race condition with example.
	b	Give the Peterson Solution for two process Synchronization. Prove that solution satisfies all the requirements for process Synchronization.

	c	Discuss the hardware-based solutions for critical section problem. Give any one hardware-based solution for two process synchronization problem.	04
5	a	Given six memory partitions of 300KB, 600KB, 200 KB, 750KB, and 125KB (in order), how would the first-fit, best-fit, and worst-fit algorithms place processes of size 115KB, 500KB, 358KB, 200KB and 375KB(in order)? Rank the algorithms in terms of how efficiently they use memory.	08
	b	What are logical and physical memories? Illustrate how logical address space is mapped to physical address space using basic paging scheme.	08
		OR	
6	a	With the help of a neat diagram, explain the demand paging scheme of memory management also discuss the steps involved in demand paging.	08
	b	Consider the following page reference string: 1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6. How many page faults will occur for LRU, FIFO, Optimal page replacement algorithms, assuming 5 free frames?	08
7	a	Explain the following allocation Schemes: i. Continuous Allocation ii. Linked Allocation iii. Indexed Allocation	08
	b	Consider a disk system with 100 cylinders. The requests to access the cylinders occur in the following sequence: 4, 34, 10, 7, 19, 73, 2, 15, 6, 20. Assuming that the head is currently at cylinder 50, what is the time taken to satisfy all requests if it takes 1ms to move from one cylinder to adjacent one and shortest seek time first policy is used?	04
	c	Consider a disk queue with requests for I/O to blocks on cylinders 98, 183, 41, 122, 14, 124, 65, 67. The LOOK scheduling algorithm is used. The head is initially at cylinder number 53 moving towards larger cylinder numbers on its servicing Pass. The cylinders are numbered from 0 to 199. Find the total head movement (in number of cylinders) incurred while servicing these requests.	04
8	a	What is deadlock? Also explain in Brief, deadlock characteristics.	08
	b	Consider the following snapshot of a system: (table below)	

	Allocation			Request			Available		
	A	B	C	A	B	C	A	B	C
P0	0	1	0	0	0	0	0	0	0
P1	2	0	0	2	0	2			
P2	3	0	3	0	0	0			
P3	2	1	1	1	0	0			
P4	0	0	2	0	0	2			

Using Banker's algorithm to detect deadlock

i. Check if there is a safe sequence. If so give the safe sequence.

ii. If P2 requests an additional instance of resource type C i.e. (0 0 1), is there a safe sequence? — 08