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RV COLLEGE OF ENGINEERING®

(An Autonomous Institution affiliated to VTU)

III Semester B. E. Examinations April/May-2023

Computer Science and Engineering

OPERATING SYSTEMS

Time: 03 Hours ***Maximum Marks: 100***

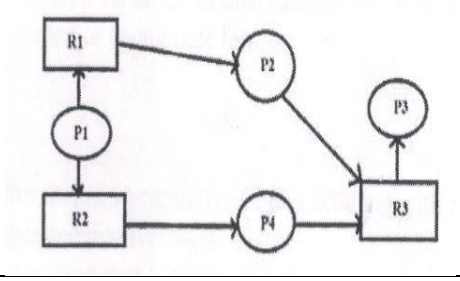
Instructions to candidates:

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	What is copy-on-write in process creation? What is it's advantage.	02

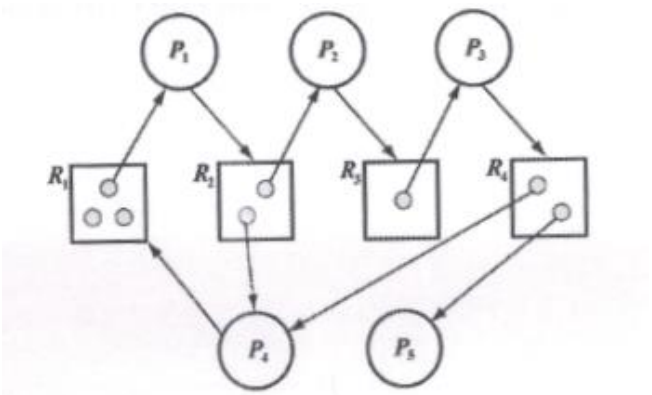
	1.2	Analyze the code below and create parent-child relationship tree to determine number of process.
		$int\ main()$
		{
		$if\ (fork()\ \&\&\ fork\ ())$
		$fork();$
		$return\ 0;$
		}
			02

	1.3	In additional reference bit algorithm, In the given table the next frame selected for replacement is _____. Give reason. $frame\ No.$ | $Additional\ bits$ 0 | 11000000 1 | 01100000 2 | 11000000 3 | 00100000 4 | 11100000	02
	1.4	If the total number of available frames is 64, and there are 2 processes one of 40 pages and the other of 100 pages then calculate number of frames allocated to each of these processes using proportional allocation method.	02
	1.5	Even if number of frames are increased, _____ algorithm may result in increased number of page faults. This scenario is known as _____.	02
	1.6	Construct a wait-for-graph for resource allocation graph below and determine if there exist a deadlock.  	02

	1.7	How the operating system and other processes are protected from being modified by an already running process?	02
	1.8	What are the three main goals of an operating systems?	02
	1.9	At a particular time of computation the value of a counting semaphore is 9 then 20 P operations and 15 V operations were completed on this semaphore determine the resulting value of the semaphore.	02
	1.10	Assuming 1 KB page size and 32,768 logical address space size, what are the page numbers and offsets for the following address references: i) 20780 ii) 9366	02

PART-B

2	a	Elucidate with the help of neat diagram the dual mode of operation and it's purpose in operating systems? Which of the following instructions need to execute in privileged mode or user mode, give reason. i) Printing file on printer ii) Create a child process iii) Sorting list of numbers iv) Read the clock	08
	b	Design a program to create N child process from same parent, where N is read from user as a command line argument. Each child should print message "Hi from child PID with parent PID", where PID is the process ID of the child and parent. The parent process should wait for all the children to exit first.	08
3	a	Consider the following set of processes with a length of the CPU burst time given in milliseconds: $Process$ | $Arrival\ Time$ | $Burst\ Time$ | $Priority$ $P1$ | 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 (lower number higher priority) and Round Robin (Time slice=3ms). Compute the average waiting time, average turnaround time and number of context switches in each approach.	10
	b	Describe the circumstances under which to use spinlocks, mutex locks, semaphores and condition variables. In each case with an example, explain why the mechanism is needed or appropriate for.	06
		OR	
4	a	Compare preemptive and non-preemptive CPU scheduling with respect to basic approach, advantages and disadvantages.	06
	b	Discuss the producer-consumer problem and propose a solution to satisfy the critical section requirement.	05

	c	Describe testandset() instruction and explain how it can be used to provide mutual exclusion that satisfies bounded waiting for n processes.	05
5	a	Differentiate paging and segmentation memory management scheme. With the help of a neat diagram discuss the logical address to physical address translation in segmentation memory management scheme.	10
	b	Consider six memory partitions of size $200\,KB$, $400\,KB$, $600\,KB$, $500\,KB$, $300\,KB$ and $250\,KB$. These partitions need to be allocated to four processes of sizes $357\,KB$, $210\,KB$, $468\,KB$ in that order. Identify the block allocation by best fit, first fit and worst fit strategy. Determine the internal and external fragmentation.	06
		OR	
6	a	Consider a reference string: 4, 7, 6, 1, 7, 6, 1, 2, 7, 2. The number of frames in the memory is 3. Find out the number of page faults respective to: Optimal and LRU page replacement algorithms.	06
	b	With respect to implementation of virtual memory bring out the relationship between all of the following with a neat diagram and explanation: Valid-invalid bit, Dirty bit, Swap Space, Page table, TLB, trap	10
7	a	Suppose that a disk drive has 5,000 cylinders, numbered 0 to 4999. The drive is currently serving a request at cylinder 2150, and the previous request was at cylinder 1805. The queue of pending requests, in $FIFO$ order, is : 1212, 2065, 2396, 2700, 454, 1618, 356, 1523, 4965, 3681 Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests for each of the following disk-scheduling algorithms? Show your work to support your answer. i) $SSTF$ ii) $SCAN$(right) iii) $C-SCAN$(right)	06
	b	Illustrate with the help of a neat diagram how $UNIX$ kernel supports Open, operation on files.	06
	c	Develop a program to implement move command (mv) in Linux operating systems using file system $APIs$.	04
8	a	Consider the following resource allocation graph. 	

	Do the following problems: i) Convert it to the matrix representation (i.e, Allocation, request and Available). ii) Do a step-by step execution of the deadlock detection algorithm. iii) Is there a deadlock? If there is a deadlock, which processes are involved?	10
b	What are the different strategies for handling deadlock? Discuss any one strategy in detail.	06