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RV COLLEGE OF ENGINEERING®

(An Autonomous Institution affiliated to VTU)

III Semester B. E. Examinations Nov/Dec-19

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	Analyze and write the output of following code:
		
		$int\ main\ (\ )$
		{
		$if\ (fork(\ )\ \&\&\ fork(\ ))$
		{
		$fork(\ );$
		}
		$printf("2\ ");$
		$return\ 0;$
		}
			02

	1.2	Consider two processes $P1$ and $P2$ accessing the shared variables X and Y protected by two binary semaphores SX and SY respectively, both initialized to 1. Complete the entry and exit sections of the following codes such that the processes can update the shared variables correctly without deadlock. $P1: while\ (true) do$ { $\ll entry\ section \gg$ $X = X + 10;$ $y = Y - 20;$ $\ll exit\ section \gg$ } $P2: while\ (true) do$ { $\ll entry\ section \gg$ $y = y + 20;$ $X = X - 10$ $\ll exit\ section \gg$ }	02
	1.3	A disk drive has 100 cylinders, numbered 0 to 99. Disk requests come to the disk driver for cylinders $12, 26, 24, 4, 42, 8$ and 60 in that order. The driver is currently serving a request at cylinder 36. A seek takes 6 msec per cylinder moved. How much seek time is needed for shortest seek time first ($SSTF$) algorithm?	02
	1.4	Suppose a process requests $12KB$ of memory and memory manager currently has a list of unallocated blocks of $6KB, 14KB, 19\ KB, 11KB$ and $13KB$ blocks. Identify the block allocated by best fit, first fit and worst fit strategy.	02

	1.5	Four jobs to be executed on a single processor system arrive at time 0 in the order A, B, C, D. Their burst CPU time requirements are $4, 1, 8, 1$ time units respectively. What is the completion time of A under round robin scheduling with time slice of one time unit?	02
	1.6	Consider a paging system with TLB. If it takes $10\,ns$ search TLB and $150\,ns$ to access the memory what is the effective memory access time with 95-percent hit ratio?	02
	1.7	What is starvation and aging in context of CPU scheduling?	02
	1.8	Applying the LRU page replacement to the reference string : 1 2 4 5 2 1 2 4. The main memory can accommodate 3 pages and it already has pages 1 and 2. Page 1 came in before page 2. Draw the page replacement pattern and determine total number of page faults.	02
	1.9	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 of memory would be proportionally allocated to each of the processes?	02
	1.10	There are three processes $P1, P2$ and $P3$ sharing a semaphore for synchronizing a variable. Initial value of semaphore is 2. Assume that negative value of semaphore tells us how many processes are waiting in queue. Processes access the semaphore in following order : a) $P1$ needs to access critical section b) $P2$ needs to access section c) $P3$ needs to access critical section d) $P2$ exits critical section. Determine the final value of semaphore.	01
	1.11	What are the four necessary and sufficient condition for deadlock to occur.	01

PART-B

2	a	Discuss the advantages of using multiple threads rather than using multiple processes using an example. Write a program to create a thread to compute sum of all the elements of an array.	06
	b	With help of neat diagram discuss the four sequence of actions of a context switch operation in process scheduling.	06
	c	Differentiate user mode and kernel mode of operation in an operating system.	04
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

i) Draw Gantt charts illustrating the execution of these processes using Preemptive SJF, Preemptive Priority and Round Robin (Time slice = $4ms$, considering arrival time as 0 for all processes)

ii) Compute the average waiting time, average turn around time for above approaches. 10

	b	What is the Reader-Writer problem? Write routines to solve Reader-Writer problem using semaphore.	06
		OR	
4	a	Consider the following set of processes with a length of the CPU burst time given in milliseconds $Process$ | $Arrival\ Time$ | $Burst\ Time$ | $Priority$ $P1$ | 7 | 5 | 1 $P2$ | 3 | 7 | 2 $P3$ | 10 | 8 | 1 $P4$ | 0 | 15 | 2 $P5$ | 20 | 3 | 1 Consider that each job has a priority as given in the table above, construct Gantt chart and find average turnaround time with mix of Preemptive SJF and Priority scheduling where Preemptive SJF will reign only when priority is same.	05
	b	Write 'C' routines to provide a deadlock free solution for Dining Philosopher problem.	05
	c	With help of neat diagram explain Linux process scheduling.	06
5	a	With help of neat diagram explain the working of paging memory management scheme.	06
	b	What is virtual memory? List the advantages of using virtual memory. Discuss the demand paging approach used to implement virtual memory with help of a neat diagram.	10
		OR	
6	a	Consider the following page reference string: 7,2,3,1,2,5,3,4,6,7,7,1,0,5,4,6,2,3,0,1 Calculate the page faults for the LRU replacement, $FIFO$ replacement and Optimal replacement algorithms, assuming initially empty three frames.	10
	b	With help of a neat diagram discuss the Segmentation memory management	06
7	a	Suppose a disk with 100 tracks and the disk request sequence (track numbers) is: $45, 20, 90, 10, 50, 60, 80, 25, 70$. Assume that the initial position of the read write head is on track 50. Calculate the distance traversed by the read-write head using Shortest Seek Time First ($SSTF$) algorithm and $SCAN$ (Elevator) algorithm (assuming that $SCAN$ algorithm moves towards 100 when it starts execution).	08
	b	With help of neat diagram discuss how $UNIX$ kernel support open operation on files.	08

8	a	Discuss the policies to recover from deadlock in operating systems	06
	b	Consider the following snapshot of a system:	

Process	*Allocation* *A B C D*	*Max* *A B C D*	*Available* *A B C D*
*P*0	2 0 0 1	4 2 1 2	3 3 2 1
*P*1	3 1 2 1	5 2 5 2	
*P*2	2 1 0 3	2 3 1 6	
*P*3	1 3 1 2	1 4 2 4	
*P*4	1 4 3 2	3 6 6 5	

Answer the following questions using the banker's algorithm:

i) How many instances of resources are present in the system under each type of a resource?
ii) Compute the Need matrix for the given snapshot of a system.
iii) Verify whether the snapshot of the present system is in a safe state
iv) If a request from process *P*1 arrives for (1,1,0,0), can the request be granted immediately? 10