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RV COLLEGE OF ENGINEERING®

(An Autonomous Institution affiliated to VTU)

III Semester B.E. Fast-track Examinations January-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	The correct solution of two process synchronization is _____.	01
	1.2	Identify the primary advantages of using virtual machines.	02
	1.3	A process executes the code. How many processes are newly created? $fork()$; $fork()$; $fork()$;	01
	1.4	What is a lazy swapper?	02
	1.5	What is the significance the valid/invalid bit in the page table?	02
	1.6	If the resources are always pre-empted from the same process, then it leads to a condition called as _____.	01
	1.7	On a sample paging system with 2^{24} bytes of physical memory, 256 pages of logical address space and a page size of 2^{10} bytes. How many bytes are there in a page frame?	01
	1.8	Consider a system with 1KB of frame size, if a small process of 100KB and an interactive database of 127KB are the only two processes running in a system with 62 free frames. Determine the proportional allocation for each process.	02
	1.9	Certain applications using counting semaphore operation in the given order 10P, 2P, 3V, 2V, 4P, 3V results in -5. In initial value of semaphore is _____.	02
	1.10	Logical address to Physical address translation inX86 system is done by _____.	01
	1.11	The minimum number of forks required to prevent deadlock in a dining philosopher's problem having 10 philosopher's is _____.	01
	1.12	The performance of the Round Robin algorithm depends heavily on the size of the time quantum. Justify the statement	02
	1.13	What is aging?	02

PART-B

<table>
<tr><td>2</td><td>a</td><td>Dual mode of operation of operating system is necessary. Justify.</td><td>04</td></tr>
<tr><td></td><td>b</td><td>Briefly describe the issues to be considered with multithreaded programs.</td><td>08</td></tr>
<tr><td></td><td>c</td><td>Identify the benefits offered by microkernel approach for building an operating system.</td><td>04</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td>3</td><td>a</td><td>Suppose the following jobs arrive for processing at the time indicated below, each job will run the listed amount of time.
<table>
<tr><th>Jobs</th><th>Arrival Time</th><th>Burst Time</th></tr>
<tr><td>1</td><td>0.0</td><td>8</td></tr>
<tr><td>2</td><td>0.4</td><td>4</td></tr>
<tr><td>3</td><td>1.0</td><td>1</td></tr>
</table>
i) Give the gantt chart for the execution of these jobs using FCFS and non-preemptve SJF scheduling algorithms.
ii) Compute the average turnaround time for the above algorithms.
iii) Compute the turnaround time if CPU is left idle for the first 1 unit then preemptive SJF is used (job1 and job2 will wait during this time</td><td>08</td></tr>
<tr><td></td><td>b</td><td>With a suitable example explain race condition. Write routines to solve the producer consumer problem using semaphores.</td><td>08</td></tr>
<tr><td colspan="4">OR</td></tr>
<tr><td>4</td><td>a</td><td>For the following example, draw the Gantt charts and calculate the average turnaround time and average waiting time for FCFS SJF and non-preemptive priority scheduling algorithms.
<table>
<tr><th>Processes</th><th>Burst Time</th><th>Priority</th></tr>
<tr><td>P1</td><td>10</td><td>3</td></tr>
<tr><td>P2</td><td>1</td><td>1</td></tr>
<tr><td>P3</td><td>2</td><td>3</td></tr>
<tr><td>P4</td><td>1</td><td>4</td></tr>
<tr><td>P5</td><td>5</td><td>2</td></tr>
</table>
Processes arrive in the order P1, P2, P3, P4, P5 all at time 0.</td><td>07</td></tr>
<tr><td></td><td>b</td><td>Write the pseudo code of Bakery's algorithm and explain how synchronization is achieved between multiple processes using this algorithm</td><td>05</td></tr>
<tr><td></td><td>c</td><td>Demonstrate the use of TestAndSet instruction for Bounded-waiting mutual exclusion</td><td>04</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td>5</td><td>a</td><td>Explain the significance of Translation Look-aside Buffer (TLB). Demonstrate paging hardware with TLB.</td><td>08</td></tr>
<tr><td></td><td>b</td><td>Consider the following page reference string, indicate the page faults and calculate the total number of page faults occurring for optimal and LRU page replacement strategies. Total number of frames available are 4 which are initially empty.
1,2,3,2,5,6,3,4,6,3,7,3,1,5,3,6,3,4,2,4,3,4,5,1</td><td>08</td></tr>
<tr><td colspan="4">OR</td></tr>
</table>

6	a	With the help of a neat diagram explain segmentation for memory management.	08
	b	Given the memory partitions of 100K, 500K, 200K, 600K (in order) which algorithm from best fit, worst fit and first fit places processes with requirements 212K, 417K, 112K, and 426K in an efficient manner?	08
7	a	Describe Second Chance (clock) page replacement algorithm with a supporting diagram.	08
	b	Suppose that the head of a moving head disk with 200 tracks numbered 0 to 199 s currently serving a request at track 143 and has just finished a request at track 125. The queue of the requests is kept in FIFO order. Calculate the total number of head movements needed to satisfy these requests for the following disk scheduling techniques: i) FCFS ii) SSTF iii) LOOK iv) C-SCAN	08
8	a	Identify the necessary conditions that must hold simultaneously for a deadlock to occur.	06
	b	Consider the following snapshot of a system:	

Process	Allocation			Maximum			Available		
	R1	R2	R3	R1	R2	R3	R1	R2	R3
P1	2	2	3	3	6	8	7	7	10
P2	2	0	3	4	3	3			
P3	1	2	4	3	4	4			

	i. Compute the NEED matrix	
	ii. Determine whether the system is in safe state or not showing step by step computations performed by the Banker's algorithm	06
c	Analyze the different ways for recovering from the deadlock.	04