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RV COLLEGE OF ENGINEERING®

(An autonomous Institution affiliated to VTU)

IV 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	Write the two major goals of operating systems.	02
	1.2	What is meant by system call?	01
	1.3	Draw the multithread server architecture.	02
	1.4	The time taken for the dispatcher to stop one process and start another running is known as _____.	01
	1.5	A major problem with priority scheduling algorithms is _____.	01
	1.6	Define critical section.	01
	1.7	Name two standard atomic operations used by semaphores.	01
	1.8	What are four necessary conditions for deadlock to occur?	02
	1.9	Write the formula for need-matrix	01
	1.10	_____ is a memory-management scheme that permits the physical address space of a process to be non-contiguous.	01
	1.11	What is Belady's anomaly	01
	1.12	Systems in which memory access times vary significantly are known collectively as _____ systems.	01
	1.13	How can you implement semaphore using messages?	02
	1.14	Distinguish between sequential and direct file access methods.	02
	1.15	CPU scheduling policy used by $XV6$ is _____.	01

PART B

2	a	With a neat diagram, explain the concept of virtual machines and also discuss the benefits of virtual machines.	06
	b	Describe Process Control Block with a block diagram.	04
	c	Write a C program to demonstrate the basic p threads API for constructing a multithreaded program that calculates the summation of a non-negative integer in a separate thread.	06
3	a	Show that Peterson's solution is a complete solution for critical section problem.	08
	b	Write the basic principles, advantages and disadvantages of $FCFS$ scheduling algorithm. Consider the following set of processes – $P0, P1, P2$ and $P3$. Their arrival time (in milliseconds) and their next burst times (in milliseconds) are also given. Draw the $GANTT$ chart, find out average turnaround time and average waiting time using $FCFS$ scheduling algorithm.	

		<table><tr><th>Process</th><th>Arrival time (ms)</th><th>Next burst (ms)</th></tr><tr><td>P0</td><td>0</td><td>10</td></tr><tr><td>P1</td><td>1</td><td>6</td></tr><tr><td>P2</td><td>3</td><td>2</td></tr><tr><td>P3</td><td>5</td><td>4</td></tr></table>	08
		OR	
4	a	Write pseudo code for TestAndSet( ) and Swap( ) in synchronization hardware solution. Prove that it satisfies mutual exclusion.	08
	b	List and explain any four scheduling criterias.	04
	c	Distinguish process-contention-scope and system-contention-scope.	04
5	a	Explain the various methods to recover from a deadlock.	06
	b	Describe the Readers-Writers problem and the Dining-Philosophers problem in detail.	10
		OR	
6	a	Consider the following snapshot of the system: (at time t_0) <table><tr><th>Process</th><th colspan="3">Allocation</th><th colspan="3">Max</th><th colspan="3">Available</th></tr><tr><td></td><td>A</td><td>B</td><td>C</td><td>A</td><td>B</td><td>C</td><td>A</td><td>B</td><td>C</td></tr><tr><td>P1</td><td>0</td><td>1</td><td>0</td><td>7</td><td>5</td><td>3</td><td>3</td><td>3</td><td>2</td></tr><tr><td>P2</td><td>2</td><td>0</td><td>0</td><td>3</td><td>2</td><td>2</td><td></td><td></td><td></td></tr><tr><td>P3</td><td>3</td><td>0</td><td>2</td><td>9</td><td>0</td><td>2</td><td></td><td></td><td></td></tr><tr><td>P4</td><td>2</td><td>1</td><td>1</td><td>2</td><td>2</td><td>2</td><td></td><td></td><td></td></tr><tr><td>P5</td><td>0</td><td>0</td><td>2</td><td>4</td><td>3</td><td>3</td><td></td><td></td><td></td></tr></table> Answer the following questions using Banker's algorithm: i) What is the content of matrix need? ii) Is the system in a safe state? If yes, find safe sequence. iii) If $P2$ sends an additional request for $(1\ 0\ 2)$, can it be granted immediately?	08
	b	Explain resource-allocation graph for a deadlock condition with an example.	04
	c	Discuss the methods for handling deadlocks.	04
7	a	Consider the following page reference string: $0\ 1\ 2\ 3\ 0\ 1\ 2\ 3\ 0\ 1\ 2\ 3\ 4\ 5\ 6\ 7$ How many page faults will occur for $FIFO, LRU$ page replacement algorithms, assuming 3 memory frames?	06
	b	Compare and contrast paging and segmentation.	06
	c	Briefly explain the working-set model used in thrashing.	04
8	a	Suppose that the head of a moving head disk with 200 tracks, numbered 0 to 199, is currently serving a request to track 143 and has just finished a request at track 125. The queue of requests is kept in the $FIFO$ order- $86, 147, 91, 177, 94, 150, 102, 175, 130$ What is the total number of head movements needed to satisfy these requests for $FCFS, SSTF$ and $SCAN$ disk-scheduling algorithms?	06
	b	What are the differences between $NTFS$ and $FAT32$ file systems? Explain.	05
	c	With the help of neat sketch, briefly explain the layers of $XV6$ file system.	05