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RV COLLEGE OF ENGINEERING®

(An Autonomous Institution affiliated to VTU)
III Semester B. E. Examinations March-2021

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	Each process is represented in the operating systems by a __________.	01
	1.2	Write any two major goals of operating systems.	01
	1.3	List the four categories of multi-threaded programming benefits.	02
	1.4	The time taken for the dispatcher to stop one process and start another running process is known as the ______________.	01
	1.5	Define Race Condition. Mention techniques to avoid Race Condition.	02
	1.6	Find the drawbacks of semaphores.	02
	1.7	Consider a time-sharing system, which supports 20 terminals (users), each of which run a compiler. If 50kB are required for compiler and 5kB for data storage, find the total amount of memory required to support 20 users.	02
	1.8	Why are page sizes always a power of 2 during paging?	02
	1.9	For a certain system, total number of frames is 64. The size of 2 processes, P_1 and P_2 are 10 and 127 respectively. How much is the allocation for each of theses processes?	02
	1.10	Compare FAT and NTFS.	02
	1.11	_____________ is the additional time for the disk to rotate the desired sector to the disk head.	01
	1.12	Write the methods for handling deadlocks.	02

PART-B

2	a	Discuss various schedulers used in Operating Systems.	05
	b	Write a ‘C’ program to demonstrate the basic Pthreads API for constructing a multi-threaded program that calculates the summation of a non-negative integer in a separate thread.	05
	c	Briefly explain microkernel and modular approaches to design operating system architecture.	06

3 a Consider the following set of process, with the length of the CPU burst time given in milli seconds:
The processes are assumed to have arrived in the order $P1, P2, P3, P4, P5$ all at time 0.

Process	Burst Time	Priority
P1	10	3
P2	1	1
P3	2	3
P4	1	4
P5	5	2

i) Draw four Gantt charts that illustrate the execution of these processes using FCFS, SJF, a non-preemptive priority and RR (q=1) scheduling.
ii) What is the turnaround time of each process for each of the scheduling algorithm in part i).
iii) What is the waiting time of each process for each of the scheduling algorithm in part i). 10

b Describe the Dining-Philosophers problem in detail. 06

OR

4 a Suppose that the following processes arrive for execution at time indicated.

Process	Arrival Time	Execution Time
P1	0.0	8
P2	0.4	4
P3	1.0	1

i) What is the average TAT for these processes with FCFS scheduling algorithm.
ii) What is the AWT and ATAT for these processes with preemptive SJF algorithm? 06

b Explain Peterson's solution to the critical section problem. 06

c Discuss process management in Linux Operating system. 04

5 a Consider the following Page reference string:
$1, 2, 3, 2, 5, 6, 3, 4, 6, 3, 7, 3, 1, 5, 3, 6, 3, 4, 2, 4, 3, 4, 5, 1.$
How many page faults will occur for FIFO and Optimal page replacement algorithms, assuming 4 free frames? 06

b Describe memory mapping and protection, memory allocation, and fragmentation issues in contiguous memory allocation. 10

OR

6 a Distinguish logical and physical address space. 05

b With a neat sketch, explain the steps in handling a page fault. 06

c What is meant by Segmentation? Discuss the hardware support for Segmentation. 05

7 a Suppose that the head of the moving head disk with 200 tracks, numbered 0 to 199, is currently serving a request at track 143 and has just finished a request at track 125. The queue of requests is kept in 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 the following disk-scheduling algorithms-i) SSTF ii) SCAN iii) LOOK iv) C-SCAN. 10

<table>
<tr><td></td><td>b</td><td>Briefly explain the strategies and schemes for allocation of frames.</td><td>06</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>8</td><td>a

b</td><td>Consider a system with five processes- P0 to P4and three resources A, B, C. Given that-
Resource type A has 10 instances; Resource type B has 5 instances. Resource type C has 7 instances.
Suppose that at time t_0, the following snapshot of the system has been taken-
<table>
<tr><th rowspan="2">Process</th><th colspan="3">Allocation</th><th colspan="3">MAX</th></tr>
<tr><th>R1</th><th>R2</th><th>R3</th><th>R1</th><th>R2</th><th>R3</th></tr>
<tr><td>P0</td><td>0</td><td>1</td><td>0</td><td>7</td><td>5</td><td>3</td></tr>
<tr><td>P1</td><td>2</td><td>0</td><td>0</td><td>3</td><td>2</td><td>2</td></tr>
<tr><td>P2</td><td>3</td><td>0</td><td>2</td><td>9</td><td>0</td><td>2</td></tr>
<tr><td>P3</td><td>2</td><td>1</td><td>1</td><td>2</td><td>2</td><td>2</td></tr>
<tr><td>P4</td><td>0</td><td>0</td><td>2</td><td>4</td><td>3</td><td>3</td></tr>
</table>
Calculate <i>available</i> matrix of resources, find the <i>need</i> matrix and also find the safe sequence.
Identify options to recover from deadlocks and explain.</td><td>10
06</td></tr>
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