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Vellore Institute of Technology

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SCHOOL OF COMPUTER SCIENCE AND ENGINEERING

Fall Semester, 2020-21

FAT Lab QP

Programme and Branch: B.Tech – CSE **Max. Marks: 50**

Course: CSE2005-Operating Systems **Duration: 1:30Hrs**

Slot: L19+L20

Instructions:

1. Write down your name, reg.no, slot and date in the answer sheet.
2. Write down aim ,algorithm in the paper.
4. Start implementing the given question.
5. Save the file with **regno** and upload the same in VTOP on or before 9.30am.
6. **Upload file must contain the following:**
    - Scanned copy of handwritten aim, algorithm
    - Copy of the implemented source code with the output screenshot

NOTE:

Write a generic code and the code must run for any values of input. Also a write a code to perform validation of the data.

1) a)Implement menu-driven program to implement Circular-SCAN and Circular-LOOK disk scheduling algorithms. Take total number of tracks (or cylinders) and current head position as run-time input. Assume head is moving towards track (or cylinder) 0 and provides service in the direction of decreasing number. Compute and display seek length and average seek length.

b) Write a program to demonstrate following page replacement algorithm:

i) Enhanced second chance

ii) MFU

Input: Buffer Size :3

Pages: 7 0 1 2 0 3 0 4 2 3 0 3 2 1 2 0 1 7 0 1

Determine the hit and miss from the above page replacement algorithms.

2) a) In the firing squad synchronization problem, consider a system with 'n' number of firing squad processes and one army camp process. Each firing process continuously loads a gun and then fire it. But to load and fire a gun, the firing squad process needs two components: bullet, silencer. One of the firing squad processes has bullet, another has silencer. The army camp has an infinite supply of all two components. The army camp places one of the components on the table. The firing squad process who has one type of component then he can grab another from the table to load and fire, after firing signal the army camp on completion. The army camp then puts out another one of the two components and the cycle repeats.Write a program to synchronize the army camp and the firing squad process using semaphore.

b)Banker's Algorithm with additional resource request checking to grant the request or not.

Consider the snapshot of the system as given below:

Process	Allocation				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P0	2	0	1	1	3	2	1	1	2	2	2	0
P1	1	1	0	0	1	2	0	2				
P2	1	0	1	0	3	2	1	0				
P3	0	1	0	1	2	1	0	1				

i) If a request from process P3 arrives for additional resources of (2,1,0,0), can the Banker's algorithm grant the request immediately?

3) a) Implement menu-driven program for page replacement using FIFO. Consider the total number of references made by CPU are 20. Take page reference string and number of page frames as run time input. Assume initially all page frames are empty. Display the number of page faults with respect to 3 and 4 frames and check for Belady's Anomaly. Display whether Belady's Anomaly exist or not.

b) Write a program to Implement Round Robin (time slice : 2ms),Longest Remaining Time First scheduling algorithm with arrival time .Find out the Average waiting Time and Average Turn Around time.

4) a) Implement menu-driven program to implement FCFS and SSTF disk scheduling algorithms. Take total number of tracks (or cylinders) and current head position as run-time input. Assume head is moving towards 0. Compute and display seek length and average seek length.

b) Implement a memory management schemes:

Free space is maintained as a linked list of nodes with each node having the starting byte address and the ending byte address of a free block. Each memory request consists of the process-id and the amount of storage space required in bytes.Allocated memory space is again maintained as a linked list of nodes with each node having the process-id, starting byte address and the ending byte address of the allocated space.

When a process finishes (taken as input) the appropriate node from the allocated list should be deleted and this free disk space should be added to the free space list. [Care should be taken to merge contiguous free blocks into one single block.This results in deleting more than one node from the free space list and changing the start and end address in the appropriate node]. For allocation use first fit and best fit.

5) a)Implement menu-driven program for page replacement using MFU and LFU. Consider the total number of references made by CPU are 16. Take page reference string and number of page frames as run time input. Compute and display number of page faults, hit ratio and miss ratio. Use stack data structure to record most recent page references. Assume initially all 3 page frames are empty. Display stack content and number of page faults.

b) Write a program to implement the following scenario using Bankers algorithm : Determine if a deadlock situation exists for the following description of a resource allocation graph, let the set of processes be P = { P1, P2, P3, P4}; let the set of resource types be: R = { R1, R2, R3, R4, R5, R6}; Here, R1 has two instance of resource type, R2 has one instance of resource type,R3 has two instance of resource type, R4 has two instance of resource type, R5 has one instance of resource type, and R6 has two instance of resource type; let the set of request and assignment edges be:
E= { R1->P3, R1->P1, R2->P2, R3->P3,P1->R2, P1->R4, P4->R6, R4->P4, P3->R2, R5->P3, P2->R5,R4->P2, R6->P3 }

6 a)Implement menu-driven program to implement Circular-SCAN and Circular-LOOK disk scheduling algorithms. Take total number of tracks (or cylinders) and current head position as run-time input. Assume head is moving towards track (or cylinder) 0 and provides service in the direction of decreasing number. Compute and display seek length and average seek length.

b) Write the menu driven shell script to show the following information:

i) Date
ii). Count the number of users logged in
iii) display free disk space
iv) Display only the directories along with the access permission and its size.
v) processes status of the user
vi). displays all created files

7) a)Implement menu-driven program using Optimal and FIFO. Consider CPU creates 20 page references. Take page reference string and number of page frames as run time input. Compute and display number of page faults with respect to 4 and 5 frames, hit ratio and miss ratio. Use stack data structure to record most recent page references. Assume initially all page frames are empty. Display stack content and number of page faults.

b) Write a program to Implement SJF, Highest-Response-Ratio-Next scheduling algorithm with arrival time and find the Average waiting Time and Average Turn Around time.

8)a) Write a Program using semaphore for following Sleeping barber problem scheme:The analogy is based upon a hypothetical barber shop with one barber. The barber has one barber chair and a waiting room with a number of chairs in it. When the barber finishes cutting a customer's hair, he dismisses the customer and then goes to the waiting room to see if there are other customers waiting. If there are, he brings one of them back to the chair and cuts his hair. If there are no other customers waiting, he returns to his chair and sleeps on it.Each customer, when he arrives, looks to see what the barber is doing. If the barber is sleeping, then the customer wakes him up and sits in the chair. If the barber is cutting hair, then the customer goes to the waiting room. If there is a free chair in the waiting room, the customer sits in it and waits his turn. If there is no free chair, then the customer leaves. Based on a naïve analysis, the above description should ensure that the shop functions correctly, with the barber cutting the hair of anyone who arrives until there are no more customers, and then sleeping until the next customer arrives. In practice, there are a number of problems that can occur that are illustrative of general scheduling problems.

b)Consider three process, all arriving at time zero, with total execution time of 10, 20 and 30 units respectively. Each process spends the first 20% of execution time doing I/O, the next 70% of time doing computation, and the last 10% of time doing I/O again. The operating system uses a shortest remaining compute time first scheduling algorithm and schedules a new process either when the running process gets blocked on I/O or when the running process finishes its compute burst. Assume that all I/O

operations can be overlapped as much as possible. Develop an algorithm and write code to find out the percentage of the CPU remain idle.

9)a) Write a program to implement following disk scheduling algorithms

i. SSTF

ii. Elevator

Consider, for example, a disk queue with requests for I/O to blocks on cylinders

98, 183, 37, 122, 14, 124, 65, 67

And disk head is initially at cylinder at 53

b)Consider four processes are arrived the ready queue at times 0, 1, 2 and 3 which require 8, 4, 9 and 5 time units to complete their execution. Develop an algorithm and write code to find out the number of context switches are needed, average turnaround time and average waiting time for the shortest job first remaining algorithm.

10) a)Implement menu-driven program for page replacement using MFU and LFU. Consider the total number of references made by CPU are 16. Take page reference string and number of page frames as run time input. Compute and display number of page faults, hit ratio and miss ratio. Use stack data structure to record most recent page references. Assume initially all 3 page frames are empty. Display stack content and number of page faults.

b) Write a program to demonstrate multilevel queuing. Queue 1 uses RR and Queue 2 use FCFS. Queue 1 is for System Task (ST) and Queue 2 is for User Task (UT).

Process	Queue	Burst Time
P1	ST	24
P2	UT	24
P3	ST	3
P4	UT	3
P5	UT	3
P6	ST	3

Calculate average waiting time and turnaround time.