**SAVEETHA SCHOOL OF ENGINEERING**

**SAVEETHA INSTITUTE OF MEDICAL AND TECHNICAL SCIENCES COMPUTER SCIENCE AND ENGINEERING PROGRAMME**

**CSA04 OPERATING SYSTEMS**

**LIST OF PROGRAMS**

1. Consider a system with 4 processes and 3 resources with the given resource matrices.

Claim matrix Allocation matrix

3 2 2 1 0 0

6 1 3 6 1 2

3 1 4 2 1 1

4 2 2 0 0 2

The resource vector is [9,3,6]. Write a C program to determine if the system is in safe or unsafe state.

1. Write a C program to illustrate the FIFO method of page replacement and determine the number of page faults for the following test case:

No of page frames: 3; Page reference sequence: 4, 1, 2, 4, 3, 2, 1 and 5.

1. Write a program to compute the average waiting time and average turnaround time based on Non Preemptive Shortest-Job-First Scheduling for the following process with the given CPU burst times, ( and the assumption that all jobs arrive at the same time.)

Process Burst Time

P1 6

P2 8

P3 7

P4 3

1. Write a C program to implement the first-fit algorithm for memory management.

Test Case:

Memory partitions: 300 KB, 600 KB, 350 KB, 200 KB, 750 KB, and 125 KB (in order) Show the outcome for the test case with first-fit algorithms to place the processes of size 115 KB, 500 KB, 358 KB, 200 KB, and 375 KB (in order)

5. Write a program to compute the average waiting time and turnaround time based on Preemptive shortest remaining processing time first (SRPT) algorithm for the following set of processes, with the arrival times and the CPU-burst times given in milliseconds

Process Arrival Time Burst Time

P1 0 5

P2 1 3

P3 2 3

P4 4 1

6. Write a C program to implement the deadlock detection algorithm for a system with 3 processes and 3 resource instances and the resource matrices are given below.

Max Matrix Allocation Matrix

3 6 8 3 3 3

4 3 3 2 0 3

3 4 4 1 2 4

The number of available resources is [1,2,0]. Determine if the system is in a deadlock state and identify the deadlocked processes.

7. Write a C program to illustrate the page replacement method where the current least recently used element is replaced and determine the number of page faults for the following test case:

No. of page frames: 3; Page reference sequence 1,2,3,2,1,5,2,1,6,2,5,6,3,1,3,6,1,2,4 and 3.

8. Write a C program to simulate FCFS disk scheduling algorithm and execute your program and find the average head movement with the following test case:

No of tracks 5; Track position:55 58 60 70 18

9. Consider three processes (process id 0, 1, 2 respectively) with compute time bursts 2, 4 and 8-time units. All processes arrive at time zero. Write a program to compute the average waiting time and average turnaround time based on First Come First Serve scheduling

10. Consider the following process table with number of processes that contains allocation field (for showing the number of resources of type: A, B and C allocated to each process in the table), max field (for showing the maximum number of resources of type: A, B, and C that can be allocated to each process). Write a program to calculate the entries of need matrix using the formula: (Need)i = (Max)i - (Allocation)i

|  |  |  |  |
| --- | --- | --- | --- |
| Process | Allocation | Max | Availble |
|  | A B C | A B C | A B C |
| P0 | 1 1 2 | 5 4 4 | 3 2 1 |
| P1 | 2 1 2 | 4 3 3 |  |
| P2 | 3 0 1 | 9 1 3 |  |
| P3 | 0 2 0 | 8 6 4 |  |
| P4 | 1 1 2 | 2 2 3 |  |

11. Write a C program to create 4 child processes. In the first child process, print the odd numbers. In the second child process print the even numbers. In the third child process print the multiple of 3. In the fourth child process print the multiples of 5. Print the process id for each of the processes.

12. Write a C program to implement the best-fit algorithm and allocate the memory block to each process.

Test Case:

Memory partitions: 300 KB, 600 KB, 350 KB, 200 KB, 750 KB, and 125 KB (in order),

Show the outcome for the test case with the best-fit algorithms to place processes of size 115 KB, 500 KB, 358 KB, 200 KB, and 375 KB (in order)

13. Write a C program to implement single-level directory system. In which all the files are placed in one directory and there are no sub directories.

Test Case: Create one directory with the name of CSE and Add 3 files(A,B,C) in to that directory

14. Write a C program to illustrate the page replacement method where the page which is not in demand for the longest future time is replaced by the new page and determine the number of page faults for the following test case:

No. of page frames: 3; Page reference sequence 7,0,1,2,0,3,0,4,2,3,0,3,2,1,2,0,1,7,0 and 1.

15.Write a C program to simulate FCFS disk scheduling algorithms and execute your program and find out and print the average head movement for the following test case.

No of tracks:9; Track position:55 58 60 70 18 90 150 160 184

16. Write a program to compute the average waiting time and average turnaround time based on First Come First Serve for the following process with the given CPU burst times, (and the assumption that all jobs arrive at the same time.)

Process Burst Time

P1 10

P2 15

P3 25

17. Write a program to compute the average waiting time and average turnaround time based on Round Robin scheduling for the following process with the given CPU burst times and quantum time slots 4 ms, ( and the assumption that all jobs arrive at the same time.)

Process Burst Time

P1 24

P2 3

P3 3

18. Write a program for solving the producer consumer problem with the following scenario: The producer should produce data only when the buffer is not full. Data can only be consumed by the consumer if and only if the memory buffer is not empty.

Test Case:

Buffer Size: 3

Consume an item in the beginning and show that the buffer is EMPTY

Produce 4 items and show that the buffer is FULL

19. Write a C program to create two threads to access shared memory which is an integer in a synchronized fashion using semaphore. In the first thread print the doubled the integer data after reading from the shared memory. In the second thread, print the five times of the integer data after reading from the shared memory

20. Write a C program to implement the worst-fit algorithm and allocate the memory block to each process.

Test Case:

Memory partitions: 300 KB, 600 KB, 350 KB, 200 KB, 750 KB, and 125 KB (in order),

Show the outcome for the test case with the worst-fit algorithms to place processes of size 115 KB, 500 KB, 358 KB, 200 KB, and 375 KB (in order)

21. Write a program to simulate the Dining Philosopher problem and verify your output with the following test case:

No of Philosophers: 5

THINKING – When philosopher doesn’t want to gain access to either fork.

HUNGRY – When philosopher wants to enter the critical section.

EATING – When philosopher has got both the forks, i.e., he has entered the section.

Philosopher i can set the variable state[i] = EATING only if her two neighbors are not eating

(state[(i+4) % 5] != EATING) and (state[(i+1) % 5] != EATING).

22. Write a C program to implement the two-level directory system.

Test Case:

3 user directories have to be created with name of user1, user2, user3 and also to create 3 files with user1 directory,2 files with user2 and user3 directory

23. Write a C program to simulate SCAN disk scheduling algorithms. and execute your program and find out and print the average head movement for the following test case.

No of tracks:5; Track position:55 58 60 70 18

24. Write a C Program to find the maximum size of a file that can be stored in the below file system that uses inodes to represent files. Disk blocks are 8 KB in size, and a pointer to a disk block requires 4 bytes. This file system has 12 direct disk blocks, as well as single, double, and triple indirect disk blocks.

Test Case:

● Check that the start blocks and the required contiguous blocks are free.

● If free, allocate those blocks to the file.

● If not free, find the next available contiguous blocks.

25. Write the C program to Calculate how many disk I/O operations are required for contiguous, linked, and indexed (single-level) allocation strategies, if, for one block, the following conditions hold in a file currently consisting of 100 blocks. Assume that the file control block (and the index block, in the case of indexed allocation) is already in memory.

Test Cases:

a. The block is added at the beginning.

b. The block is added in the middle.

c. The block is added at the end.

26. Write a program to compute the average waiting time and average turnaround time based on Priority scheduling for the following process with the given CPU burst times (and the assumption that all jobs arrive at the same time.)

Process Burst Time Priority

P1 30 2

P2 5 1

P3 12 3

27. Write a program for semaphore signaling mechanism where a process can signal a process that is waiting on a semaphore.

Test Case:

number of instances: 4

Number of Processes: 4 (P1, P2, P3, P4) all are calling wait operation on S

Show the response when another process P5 wants the same resource.

28. Write a C program to create a file using the system call. Read the data from the user and write the same in the file. Also, Read the data from the file and print the same in the console.

29.Write a C program to implement the first-fit algorithm for memory management.

Test Case:

Memory partitions: 40 KB, 10 KB, 30 KB, 60 KB, (in order) Show the outcome for the test case with first-fit algorithms to place the processes of size 100 KB.50 KB.30 KB ,120 KB,35 KB (in order)

30. Write a C Program to create two threads and print even numbers with one thread and odd numbers with another thread.

31. Write a C program to simulate CSCAN disk scheduling algorithms and execute your program and find out and print the average head movement for the following test case.

No of tracks:5; Track position:55 58 60 70 18

32. Write a C program to simulate SCAN disk scheduling algorithms and execute your program and find out and print the average head movement for the following test case.

No of tracks:9

Track position:55 58 60 70 18 90 150 160 184

33. Write a C program using the wait system call to synchronize the parent process and child process. In the parent process print the prime numbers. In the child process generate the Fibonacci series.

34. Write a C program to implement the worst-fit algorithm and allocate the memory block to each process.

Test Case:

Memory partitions: 40 KB, 10 KB. 30 KB, .60 KB (in order),

Show the outcome for the test case with the worst-fit algorithms to place processes of size 100 KB.50 KB.30 KB .120 KB,35 KB (in order)

35. Write a C program to simulate the sequential file allocation in a very simple file system with a disk of 16 blocks, each block is of 1 KB size and first 8 blocks (0 to 7) are allocated to the “iNodes” and can’t be used by the file system. Blocks available for allocation are from block 8 to block 16. Minimum file size is 1 KB. Check that the start blocks and the required contiguous blocks are free. If free, allocate those blocks to the file. If not free, find the next available contiguous blocks.

Test Case: If there are not enough contiguous blocks available for a file, the program must exit ()

36. Write a C program to simulate SSTF disk scheduling algorithm and execute your program and find the average head movement with the following test case:

No of tracks 5; Track position:55 58 60 70 18

37. Write a C program to illustrate the Optimal method of page replacement and determine the number of page faults for the following test case:

No of page frames: 3; Page reference sequence: 4, 1, 2, 4, 3, 2, 1 and 5.

38. Consider three processes (process id 0, 1, 2 respectively) with compute time bursts 2, 4 and 8-time units. All processes arrive at time zero. Write a program to compute the average waiting time and average turnaround time based on Shortest Job First Scheduling.

39. Write a C program to simulate LOOK disk scheduling algorithms. and execute your program and find out and print the average head movement for the following test case.

No of tracks:5; Track position:55 58 60 70 18

40. Write a C program to simulate CLOOK disk scheduling algorithms. and execute your program and find out and print the average head movement for the following test case.

No of tracks:5; Track position:55 58 60 70 18