USN 01JCE21CS121 Code: 20CS410

JSS MAHAVIDYAPEETHA

JSS SCIENCE AND TECHNOLOGY UNIVERSITY, MYSURU

Department of Computer Science and Engineering

IV Semester TEST-1

Operating Systems

Duration: 1 Hr Date: 04-05-2023 Time: 4 PM- 5 PM Max. Marks: 20

NOTE: Question no. 1 is compulsory. There is internal choice between Question no. 2 and 3.

Q.NO	CO	CD	PI	QUESTION	MARKS
1.	CO1	L1	1.4.1	a) Discuss the role of operating system with user and system viewpoints. b) With diagrams wherever required, discuss the classification of computer system architecture based on the number of general purpose processors.	03 07
2.	CO1	L2	2.2.4	a) With a neat diagram, discuss the dual mode operation of computer system. Also, justify how it ensures protection in contemporary operating systems. b) Compare and contrast client-server systems with peer-to-peer systems.	05 05
				[OR]	
3.	CO1	L2	2.2.4	a) What are system calls? List the process control system calls. Also illustrate variations in process control with respect to single-tasking system and multitasking system b) Discuss the advantages of the layered approach to system design over monolithic structure? What are the disadvantages of the layered approach?	05 05

Course Outcomes	
CO–1	Explain the concepts, goals, design and construction of operating systems.
CO–2	Illustrate inter-process communication, multithread handling and analyse various CPU scheduling algorithms.
CO–3	Solve process synchronization and Deadlock handling mechanisms.
CO–4	Apply the knowledge of main memory and virtual memory to solve paging and page replacement problems.
CO–5	Explain the concept of storage management, file system and analyse different disk scheduling techniques.

Performance Indicators (PI's)	
1.4.1	Apply theory and principles of computer science and engineering to solve an engineering problem
2.2.4	Compare and contrast alternative solution/methods to select the best methods

Cognitive Domain (CD)	
L1	Knowledge
L2	Comprehension
L3	Application
L4	Analysis

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Department of Computer Science and Engineering

IV Semester TEST-2
Operating Systems

Duration: 1 Hr Date: 12-06-2023 Time: 2.30 PM- 3:30 PM Max. Marks: 20

NOTE: Question no. 1 is compulsory. There is internal choice between Question no. 2 and 3.

<table>
<tr><th>Q.NO</th><th>CO</th><th>CD</th><th>PI</th><th>QUESTION</th><th>MARKS</th></tr>
<tr><td>1.</td><td>CO2</td><td>L1</td><td>1.4.1</td><td>Consider the following set of processes, with the length of the CPU burst time and arrival time given in milliseconds. Also, smaller priority number implies a higher priority.
<table><tr><th>Process ID</th><th>Arrival Time</th><th>Burst Time</th><th>Priority</th></tr><tr><td>P1</td><td>2</td><td>1</td><td>4</td></tr><tr><td>P2</td><td>1</td><td>5</td><td>5</td></tr><tr><td>P3</td><td>4</td><td>1</td><td>1</td></tr><tr><td>P4</td><td>0</td><td>6</td><td>3</td></tr><tr><td>P5</td><td>2</td><td>3</td><td>2</td></tr></table>Draw the Gantt Charts to illustrate the execution of these processes using the following scheduling algorithms:
a) FCFS
b) Preemptive SJF
c) Non-preemptive Priority
d) Preemptive Priority
e) Round Robin with Time Quantum = 2 ms
f) Compute the average turnaround time, average waiting time and average response time of these scheduling algorithms.</td><td>10</td></tr>
<tr><td>2.</td><td>CO2</td><td>L2</td><td>2.2.4</td><td>a) Explain the process states with state transition diagram. Also explain PCB with a neat diagram.
b) Illustrate how a multi-thread application is run on single-core and multi-core chips? Also discuss the programmers challenges while implementing multithreaded programming in multicore systems.</td><td>05
05</td></tr>
<tr><td colspan="6">[OR]</td></tr>
<tr><td>3.</td><td>CO2</td><td>L2</td><td>2.2.4</td><td>a) Illustrate with examples, mechanism to allow process communication without sharing address space.
b) Discuss the threading issues with respect to cancellation, signal handling and thread pool.</td><td>05
05</td></tr>
</table>

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JSS MAHAVIDYAPEETHA

JSS SCIENCE AND TECHNOLOGY UNIVERSITY, MYSURU

Department of Computer Science and Engineering

IV Semester TEST-3

Operating Systems

Duration: 1 Hr Date: 06-07-2023 Time: 1.30 PM- 2.30 PM Max. Marks: 20

NOTE: Question no. 1 is compulsory. There is internal choice between Question no. 2 and 3.

<table>
<tr><th>Q.NO</th><th>CO</th><th>CD</th><th>PI</th><th>QUESTION</th><th>MARKS</th></tr>
<tr><td>1.</td><td>CO3</td><td>L3</td><td>1.4.1</td><td>Consider the following snapshot of a system:
<table>
<tr><th rowspan="2">PID</th><th colspan="3">Allocation</th><th colspan="3">Maximum</th><th colspan="3">Available</th></tr>
<tr><th>A</th><th>B</th><th>C</th><th>A</th><th>B</th><th>C</th><th>A</th><th>B</th><th>C</th></tr>
<tr><td>P0</td><td>1</td><td>1</td><td>2</td><td>4</td><td>3</td><td>3</td><td>3</td><td>1</td><td>0</td></tr>
<tr><td>P1</td><td>2</td><td>1</td><td>2</td><td>3</td><td>2</td><td>2</td><td></td><td></td><td></td></tr>
<tr><td>P2</td><td>4</td><td>0</td><td>1</td><td>9</td><td>0</td><td>2</td><td></td><td></td><td></td></tr>
<tr><td>P3</td><td>0</td><td>2</td><td>0</td><td>7</td><td>5</td><td>3</td><td></td><td></td><td></td></tr>
<tr><td>P4</td><td>1</td><td>1</td><td>2</td><td>11</td><td>2</td><td>3</td><td></td><td></td><td></td></tr>
</table>
Answer the following questions using Banker's algorithm:
i) Is the system in safe state? If yes, determine the safe sequence.
ii) For the above snapshot, determine whether the following requests can be granted immediately? If so, find the safe sequence, otherwise illustrate why request can't be granted.
a) Request from process P1 arrives for (2,1,0)
b) Request from process P3 arrives for (2,0,1)</td><td>10</td></tr>
<tr><td>2.</td><td>CO3</td><td>L2</td><td>2.2.4</td><td>a) Illustrate Race condition with an example. With the general structure of a process, explain the requirements that must be satisfied by a solution to the critical section problem.
b) Describe how the TestAndSet() instruction can be used to provide mutual exclusion that satisfies bounded waiting requirement.</td><td>05

05</td></tr>
<tr><td colspan="6">[OR]</td></tr>
<tr><td>3.</td><td>CO3</td><td>L2</td><td>2.2.4</td><td>a) Discuss the use of semaphores in solving critical section problem avoiding busy wait.
b) What are Monitors? Give solution to Dining Philosopher's problem using Monitor.</td><td>05

05</td></tr>
</table>

JSS MAHAVIDYAPEETHA

JSS SCIENCE AND TECHNOLOGY UNIVERSITY, MYSURU

IV Semester B.E Degree Examination

Department of Computer Science and Engineering

OPERATING SYSTEMS

Duration: 3 Hrs | Max. Marks:100

NOTE: Answer all the questions. Part- B has internal choice.

PART – A

<table>
<tr><th>Q.NO</th><th>CO</th><th>CD</th><th>PI</th><th>QUESTION</th><th>MARKS</th></tr>
<tr><td>1.</td><td>CO1</td><td>L2</td><td>1.7.1</td><td>a. Discuss the classification of computer architecture based on the number of general purpose processors used. Which one is more useful and appraise its advantages.
b. With a neat diagram, discuss the dual mode operation of operating system.</td><td>05

05</td></tr>
<tr><td>2.</td><td>CO2</td><td>L4</td><td>2.6.3</td><td>Consider the following set of processes, with the length of the CPU burst time and arrival time given in milliseconds.
<table>
<tr><th>Process ID</th><th>Arrival Time</th><th>Priority</th><th>Burst Time</th></tr>
<tr><td>P1</td><td>2</td><td>4</td><td>1</td></tr>
<tr><td>P2</td><td>1</td><td>5</td><td>5</td></tr>
<tr><td>P3</td><td>4</td><td>1</td><td>1</td></tr>
<tr><td>P4</td><td>0</td><td>3</td><td>6</td></tr>
<tr><td>P5</td><td>2</td><td>2</td><td>3</td></tr>
</table>
Draw the Gantt Charts to illustrate the execution of these processes using the following scheduling algorithms:
i) Preemptive SJF
ii) Preemptive Priority
iii) Round Robin with Time Quantum = 2 ms
Compute the average turnaround time, average waiting time and average response time of these scheduling algorithms.</td><td>10</td></tr>
<tr><td>3.</td><td>CO4</td><td>L3</td><td>2.6.3</td><td>Define the hardware instructions TestAndSet( ) and Swap( ). Also give the algorithms for implementing mutual exclusion with these instructions.</td><td>10</td></tr>
</table>

4.	CO3	L4	2.8.1	Consider the following page reference string : <1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6 > Find the number of page faults and page fault ratio with FIFO, LRU and Optimal page replacement algorithms assuming 4 frames. Which one of the above is most efficient?	10
5.	CO4	L4	2.8.1	Suppose a disk is having 200 cylinders numbered from 0 to 199. The disk is currently servicing at cylinder 53 and previous request was at cylinder 60. The Queue of pending request in FIFO order is 50 , 91 , 150 , 92, 130, 18, 140, 70, 60 Starting from the current head position draw the scheduling chart and calculate the total distance(in cylinders) that the disk arm moves to satisfy all the pending requests for each of the following disk scheduling algorithms? i) FCFS ii) SSTF iii) SCAN iv) C-SCAN v) C-LOOK	10

PART – B

Q.NO	CO	CD	PI	QUESTION	MARKS
6	CO1	L2	1.7.1	Explain two sets of operating system services that are helpful to user as well as efficient operation of system.	10
				OR	
7	CO1	L1	2.6.4	With a neat diagram, discuss the salient features of microkernels approach of operating system structure. Also discuss how modular approach is different from microkernel and layered approaches.	10
8	CO1 CO1	L1	1.7.1 2.6.4	a. What is a process? With a state transition diagram, explain the various states of a process. b. Discuss the two models of inter-process communication? What are the strengths and weakness of the two approaches?	05 05
				OR	
9	CO1	L2	1.7.1	a. Explain different multithreading models with neat sketch.	05

	CO1	L1	1.7.1	b. How does a multithread application run on single and multi-core chips? Also, discuss the challenges faced by programmers while implementing multithreaded programming in multicore systems.	05
10	CO3	L3	2.6.3	What are semaphores? Discuss the use of semaphores in solving critical section problem avoiding busy wait. Also, appraise the applications and limitations of semaphores with examples.	10
				OR	
11	CO3	L4	2.8.1	Consider the following snapshot of a system: PID / Allocation (A B C D) / Maximum (A B C D) / Available (A B C D) P0: 2 0 0 1 / 4 2 1 2 / 3 3 2 1 P1: 3 1 2 1 / 5 2 5 2 P2: 2 1 0 3 / 2 3 1 6 P3: 1 3 1 2 / 1 4 2 4 P4: 1 4 3 2 / 3 6 6 5 Answer the following questions using Banker's algorithm: i) What is the content of the need matrix? ii) Is the system in safe state? If yes, determine the safe sequence. iii) If a request from process P1 arrives for (1,1,0,0), can the request be granted immediately?	10
12	CO4	L4	2.6.3	Explain the First fit, Best fit, Worst fit memory management algorithms. Also, given memory partitions of 300 KB, 600 KB, 100 KB, 500 KB and 400 KB (in order) illustrate how each of these algorithms place processes of 350 KB, 420 KB, 110 KB and 440 KB (in order).	10
				OR	
13	CO3	L2	1.7.1	a. Explain segmentation with hardware. b. Explain with neat diagram handling page fault	05 05
14	CO1	L1	1.7.1	Explain any three directory structures with their advantages and disadvantages.	10

OR					
15	CO1	L1	1.7.1	Explain the following: i) File types ii) File operations iii) File attributes	10

Course Outcome: At the end of the course the students will have the ability to	
CO–1	Understand various activities of process, thread, memory, file and secondary storage components of an Operating System.
CO–2	Apply various scheduling algorithm of process, memory and secondary storage components.
CO–3	Analyze the concepts of inter process communication, deadlocks, memory allocation strategies, page replacement algorithms of OS.
CO–4	Evaluate various algorithms for handling processes, threads, memory allocation strategies and deadlocks.

Performance Indicators (PI's)	
1.7.1	Apply theory and principles of computer science and engineering to solve an engineering problem
2.6.3	Identify existing solution/methods to solve the problem, including forming justified approximations and assumptions
2.6.4	Compare and contrast alternative solution/methods to select the best methods
2.8.1	Applies engineering mathematics to implement the solution.

Cognitive Domain (CD)	
L1	Knowledge
L2	Comprehension
L3	Application
L4	Analysis

--- End ---