U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

October 2024 Supplementary Examinations

Programme: B.E. **Semester: IV**
Branch: CSE(DS),CSE(ICB),AI&DS **Duration: 3 hrs.**
Course Code: 23DC4PCOPS **Max Marks: 100**
Course: Operating Systems

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

			CO	PO	Marks
		UNIT - I			
1	a)	List and explain the different system utilities which provide convenient environment for program development & execution.	*CO1*	*PO1*	**6**
	b)	A user decides to use a simple text editor to create, edit, and save his files. He initiates the process of opening a file within the editor by selecting "Open" from the menu. Explain how the operating system handles this operation.	*CO2*	*PO2*	**6**
	c)	Illustrate with a neat diagram, the transitions between user and kernel modes during system start-up followed by a user application requesting a service from the operating system.	*CO2*	*PO2*	**8**
		UNIT - II			
2	a)	Brief out how multithreading is more efficient than creating multiple processes for handling multiple client requests in a web server with architecture and explain multithreading benefits	*CO2*	*PO2*	**10**
	b)	Explain Process Control Block (PCB) in detail. Analyze the state save and state restore for context switch of CPU from process to process during interrupts.	*CO2*	*PO2*	**10**
		OR			
3	a)	Explain different types of multithreading models with diagrams.	*CO1*	*PO1*	**10**
	b)	Analyze the Dining Philosopher’s problem with the possible solutions for the same.	*CO2*	*PO2*	**10**
		UNIT - III			
4	a)	Discuss the approaches to CPU scheduling in a multiprocessor system.	*CO1*	*PO1*	**10**

b) Given below are the CPU-burst times of five processes arriving at time 0.

i) Draw the Gantt Chart using FCFS, SJF and RR scheduling with Quantum = 10ms

ii) Calculate the average waiting time, average turnaround time and average response time.

iii) Identify which algorithm would give the minimum average waiting time

Process	Burst time (msecs)
P1	10
P2	29
P3	3
P4	7
P5	12

CO2 *PO2* **10**

OR

5 a) Consider a multi-user environment in which two processes are involved in file operations:

1. **Process Setup:**
   - **Process P1:** Requests a lock on File X and then File Y.
   - **Process P2:** Requests a lock on File Y and then File X.
2. **Resource Allocation:**
   - **P1** acquires a lock on File X.
   - **P2** acquires a lock on File Y.

Identify the conditions that the system designers and administrators should consider critical for designing robust file systems and ensuring smooth operation without any deadlocks.

Explain how such a deadlock situation can be described using resource allocation graph.

CO1 *PO1* **10**

<table>
<tr><td></td><td></td><td>b)</td><td>Consider 5 processes, P0 through P4, and 4 types of resources.
At T0 we have the following system state:
Max Instances of Resource Type A = 3, B = 17, C = 16, D = 12
<table>
<tr><th></th><th colspan="4">Allocation</th><th colspan="4">Max</th><th colspan="4">Available</th></tr>
<tr><th></th><th>A</th><th>B</th><th>C</th><th>D</th><th>A</th><th>B</th><th>C</th><th>D</th><th>A</th><th>B</th><th>C</th><th>D</th></tr>
<tr><td><b>P0</b></td><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td><td>2</td><td>1</td><td>0</td><td>1</td><td>5</td><td>2</td><td>0</td></tr>
<tr><td><b>P1</b></td><td>1</td><td>2</td><td>3</td><td>1</td><td>1</td><td>6</td><td>5</td><td>2</td><td></td><td></td><td></td><td></td></tr>
<tr><td><b>P2</b></td><td>1</td><td>3</td><td>6</td><td>5</td><td>2</td><td>3</td><td>6</td><td>6</td><td></td><td></td><td></td><td></td></tr>
<tr><td><b>P3</b></td><td>0</td><td>6</td><td>3</td><td>2</td><td>0</td><td>6</td><td>5</td><td>2</td><td></td><td></td><td></td><td></td></tr>
<tr><td><b>P4</b></td><td>0</td><td>0</td><td>1</td><td>4</td><td>0</td><td>6</td><td>5</td><td>6</td><td></td><td></td><td></td><td></td></tr>
<tr><td><b>Total</b></td><td><b>2</b></td><td><b>12</b></td><td><b>14</b></td><td><b>12</b></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>
i. Use the safety algorithm to test if the system is in a safe state or not?
ii. If safe, determine the safe sequence.
iii. If a request from process P2 arrives for (1,3,4,0) can the request be ranted immediately</td><td><b><i>CO2</i></b></td><td><b><i>PO2</i></b></td><td><b>10</b></td></tr>
<tr><td></td><td></td><td></td><td><b>UNIT - IV</b></td><td></td><td></td><td></td></tr>
<tr><td></td><td>6</td><td>a)</td><td>Define paging. Explain with diagram how the logical address is converted to physical address.</td><td><b><i>CO1</i></b></td><td><b><i>PO1</i></b></td><td><b>7</b></td></tr>
<tr><td></td><td></td><td>b)</td><td>Explain how paging is supported by TLB with a neat diagram.
i) How TLB solves the problem of 32bit system page table entries by reducing access time.</td><td><b><i>CO2</i></b></td><td><b><i>PO2</i></b></td><td><b>7</b></td></tr>
<tr><td></td><td></td><td>c)</td><td>Explain swapping in memory management with neat diagram</td><td><b><i>CO1</i></b></td><td><b><i>PO1</i></b></td><td><b>6</b></td></tr>
<tr><td></td><td></td><td></td><td><b>UNIT - V</b></td><td></td><td></td><td></td></tr>
<tr><td></td><td>7</td><td>a)</td><td>Discuss the building blocks that are required for efficient virtualization.</td><td><b><i>CO1</i></b></td><td><b><i>PO1</i></b></td><td><b>6</b></td></tr>
<tr><td></td><td></td><td>b)</td><td>Explain how live migration is implemented easily in virtual machine manager (VMM) when compared to general-purpose operating systems.</td><td><b><i>CO1</i></b></td><td><b><i>PO2</i></b>
<i>1</i></td><td><b>7</b></td></tr>
<tr><td></td><td></td><td>c)</td><td>Describe trap-and-emulate method employed by virtual machines to transfer control from virtual user mode to virtual kernel mode</td><td><b><i>CO2</i></b></td><td><b><i>PO2</i></b></td><td><b>7</b></td></tr>
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