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Academic Year: 2022-23

Programme: MCA

Year: I Semester: I

Subject: Operating Systems

Date: 16 December 2022

Marks: 100
Time: 10.30 am - 01.30 pm
Durations: 3 (Hrs)
No. of Pages: 2

Final Examination

Instructions: Candidates should read carefully the instructions printed on the question paper and on the cover of the Answer Book, which is provided for their use.
1) Question No. _1___ is compulsory.
2) Out of remaining questions, attempt any __4___ questions.
3) **In all ___5_ questions to be attempted.**
4) All questions carry equal marks.
5) **Answer to each new question to be started on a fresh page.**
6) **Figures in brackets on the right hand side indicate full marks.**
7) **Assume Suitable data if necessary.**

Q1		**Answer briefly:**	**[20]**
CO-2;SO-1,6; BL-5	**a.**	**Justify the statement. Process creation is heavyweight and Thread creation is lightweight.**	**5**
CO-2 ; SO1,6- ; BL-2	**b.**	**Explain the concept of Mutex locks to ensure synchronization.**	**5**
CO-3 ; SO-1,6 ; BL-4	**c.**	**Differentiate between internal and external fragmentation with examples in memory partitioning.**	**5**
CO-3 ; SO1,6- ; BL-2	**d.**	**Discuss the requirement of I/O Buffering and its types.**	**5**
Q2 **CO-1,2; SO-1,6; BL-3**	**a.** **b.**	**Interpret the following.** **1)User mode vs Kernel mode 2) Tightly coupled Systems vs Loosely coupled systems** **Consider the following set of processes with the length of the CPU burst time given in milliseconds** **Draw the Gantt chart for FCFS, SRTF, and RR-2 Scheduling. Calculate the average waiting time and turnaround time.**	**[5 + 5]** **[10]**

PROCESS	AT	BT
P1	0	7
P2	2	4
P3	3	2
P4	9	1

<table>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>Q3
CO-2, SO-1,6, BL-2</td><td>a.

b.</td><td>Identify the IPC problem encountered with the Reader Writer scenario and illustrate it by using suitable Semaphores in various cases.

Discuss all three cases of Deadlock existence in Diner Philosopher's problem and illustrate the solution for recovering from the same.</td><td>[10]

[10]</td></tr>
<tr><td>Q4
CO-3; SO-1,6; BL-3</td><td>a.

b.</td><td>3 frames have been allocated to a process. The reference string is 1,2,1,3,7,4,5,6,3,2,4,5,6,7,1. Calculate hit and miss ratio for all three algorithms. (FIFO, LRU, OPT). Compare their efficiency.

For a disk of 100 tracks, with the initial position at 50 and pending requests are 45,20,90,10,50,60,80,25,70. Calculate head movement for SSTF, SCAN, and CLOOK. If one adjacent track movement takes 0.5ms, what is the total time taken for the whole requests for individual methods? Compare their Efficiency. (Assume initially the head movement for SCAN:-outwards and CLOOK:-inwards)</td><td>[10]

[10]</td></tr>
<tr><td>Q5
CO-2; SO-1,6; BL-2,3</td><td>a.
b.</td><td>Discuss the various types of the Process scheduler.
Interpret the working of Peterson's Solution in the context of Process synchronization</td><td>[10]

[10]</td></tr>
<tr><td>Q6
CO-3; SO-1,6; BL-1,2,3</td><td>a.1.

a.2
b.</td><td>A system of 4 processes (P0, P1, P2, and P3) with the following allocation and Max matrix in which only 5 instances of A and 3 instances of B are the only resources available at a particular instance. As per the following scenario, Will the system be in a Safe state? If yes, what is the Process termination sequence order?
<table>
<tr><th></th><th colspan="3">Allocation</th><th colspan="3">Max</th></tr>
<tr><th></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>0</td><td>2</td><td>4</td><td>3</td><td>2</td></tr>
<tr><td>P1</td><td>1</td><td>2</td><td>2</td><td>2</td><td>3</td><td>6</td></tr>
<tr><td>P2</td><td>1</td><td>1</td><td>3</td><td>1</td><td>3</td><td>5</td></tr>
<tr><td>P3</td><td>2</td><td>0</td><td>1</td><td>5</td><td>4</td><td>1</td></tr>
</table>
Explain the necessary reasons for the occurrence of a Deadlock.
Discuss Segmentation Hardware in Memory management with a diagram and list the advantages and disadvantages of Segmentation vs Paging.</td><td>[06]

[04]

[10]</td></tr>
<tr><td>Q7
CO-3; SO-1,6; BL-1,2,3</td><td>a.

b.

c.</td><td>Discuss various File Allocation methods. What are the issues faced in File allocation?
Explain Demand Paging with the help of a diagram. What do you understand by valid & invalid bit?
Define following Terminologies
i) PCB ii) Context switching</td><td>[10]

[5]

[5]</td></tr>
</table>