Reg.No.										

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

IV SEMESTER B.TECH. (COMPUTER SCIENCE & ENGINEERING)
END SEMESTER EXAMINATION, MAY 2023

SUBJECT: OPERATING SYSTEMS [CSE 2272]

REVISED CREDIT SYSTEM

Time: 3 Hours **MAX. MARKS: 50M**

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.

1A. Consider the following snapshot of a system. (5M) (CO3, L3)

Process	Allocation				Max				Available			
	A	B	C	D	A	B	C	D	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) How many instances of resources are present in the system under each type of resource?

ii) Compute Need Matrix for the given system.

iii) Illustrate that the system is in a safe state by demonstrating an order in which the processes may be completed.

If a request from process P1 arrives for (1,1,0,0), can the request be granted immediately? Justify with the safe sequence.

1B. List the purpose of the command interpreter. Why is it usually separate from the kernel? Would it be possible for the user to develop a new command interpreter using the system-call interface provided by the operating system? (3M) (CO1, L2)

1C. Explain the benefits and detriments of symmetric and asymmetric communication. (2M) (CO1, L2)

<table>
<tr><td>2A.</td><td>Apply FIFO, LRU and optimal page replacement algorithms for the following page reference string: 6, 1, 1, 2, 0, 3, 4, 6, 0, 2, 1, 2, 1, 2, 0, 3, 2, 1, 2, 0. Assume 3 frames and all frames are initially empty. Calculate the number of page faults for each algorithm.</td><td>(5M)
(CO4, L3)</td></tr>
<tr><td>2B.</td><td>i. Scheduling the following processes P1,P2,P3,P4,P5,P6 using pre-emptive Round Robin algorithm. Illustrate the scheduling using Gannt Chart. Calculate Average Waiting time and Turnaround time. Quantum=2ms.

<table><tr><th>Process</th><th>Arrival Time</th><th>Burst Time</th></tr><tr><td>P1</td><td>0</td><td>4</td></tr><tr><td>P2</td><td>1</td><td>5</td></tr><tr><td>P3</td><td>2</td><td>2</td></tr><tr><td>P4</td><td>3</td><td>1</td></tr><tr><td>P5</td><td>4</td><td>6</td></tr><tr><td>P6</td><td>6</td><td>3</td></tr></table>ii. Write a short note on copy on write.</td><td>(3M)
(CO3, CO4 L15, L3)</td></tr>
<tr><td>2C.</td><td>Explain about the inter process communication using shared memory with suitable code snippet.</td><td>(2M)
(CO1, L2)</td></tr>
<tr><td>3A</td><td>Explain in detail about LRU approximation algorithms with suitable example.</td><td>(5M)
(CO4,L2)</td></tr>
<tr><td>3B</td><td>Explain race condition with an example and provide hardware based solution to address the problem in a detailed manner.</td><td>(3M)
(CO2,L2)</td></tr>
<tr><td>3C</td><td>With the help of neat diagram, explain different states of a process. Mention the roles of Process Control Block along with all the pieces of information that is stored related to the process with neat diagram.</td><td>(2M)
(CO1,L2)</td></tr>
<tr><td>4A</td><td>Explain in detail about fixed and global allocation of frames with an example. Let us assume if there are 100 frames and 5 processes. Calculate frames allocated for each process using fixed allocation and proportional allocation.</td><td>(5M)
(CO4,L2,L3)</td></tr>
<tr><td>4B</td><td>Consider a single level paging scheme with TLB. Assume no page fault occurs. It takes 100 ns to access the physical memory. If TLB hit ratio is 60% and effective memory access time is 160 ns, Find TLB access time?. Define thrashing.</td><td>(3M)
(CO4,L3,L2)</td></tr>
<tr><td>4C</td><td>Suppose that a disk drive has 5000 cylinders numbered 0 to 4999. The drive is currently serving a request at cylinder 143 and the previous request was at cylinder 125. The queue of pending requests in FIFO order is 86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130. Starting from the current head position, what is the total distance in cylinders that the disk arm moves to satisfy all the pending request for Shortest Seek Time First (SSTF) algorithm.</td><td>(2M)
(CO5,L3)</td></tr>
<tr><td>5A</td><td>Discuss the strengths and weaknesses of implementing an access matric using access lists that are associated with objects. Illustrate how access matrix is used for different operations</td><td>(5M)
(CO5,L2)</td></tr>
<tr><td>5B</td><td>Write a program for file locking using Java API. Explain in detail about file mounting with suitable example.</td><td>(3M)
(CO5,L4)</td></tr>
<tr><td>5C</td><td>Explain Acyclic Graph Directory Structure and Two-level directory structure.</td><td>(2M ,L2)
(CO5,L2)</td></tr>
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