Reg.No.										

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

IV SEMESTER B.TECH. (COMPUTER SCIENCE & ENGINEERING)
END SEMESTER MAKEUP 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. Write bankers algorithm for dead lock avoidance. Considering a system with five processes P0 through P4 and three resource types A, B, C is given below. i) Calculate the need matrix. ii) Check whether the system is safe or not? If safe, what is the safe sequence? iii) Calculate the total sum of each type of resource? (5M) (CO3, L2,L3)

Processes	Allocation			Max			Available		
	A	B	C	A	B	C	A	B	C
P0	1	1	2	4	3	3	2	1	0
P1	2	1	2	3	2	2			
P2	4	0	1	9	0	2			
P3	0	2	0	7	5	3			
P4	1	1	2	1	1	2			

Table Q.1A

1B. Describe how the Swap() instruction can be used to provide mutual exclusion that satisfies the bounded waiting requirement. (3M) (CO2, L2)

1C. Consider process P_o is interrupted during its execution and there is a context-switch to another Process P_1 by the CPU. Describe the action taken by a kernel to context-switch between the processes with a diagram. (2M) (CO1, L2)

2A. Explain segmentation architecture. How is protection achieved in segmentation?
Consider five memory partitions of size 100 KB, 500 KB, 200 KB, 450 KB and 600 KB in same order. If sequence of requests for blocks of size 212 KB, 417 KB, 112 KB and 426 KB in same order come, Apply First fit, worst fit and best fit algorithms for memory allocations. Find the optimal algorithm for memory allocation and justify. (5M) (CO4, L2,L3)

<table>
<tr><td></td><td></td><td></td></tr>
<tr><td>2B.</td><td>i. List the roles of Lazy swapper.
ii. Calculate Average waiting time and Average turnaround time for non-preemptive SJF and preemptive SJF with the help of a Gannt Chart for the following data.

<table><tr><th>Process</th><th>Arrival Time (msec)</th><th>Burst Time(msec)</th></tr><tr><td>P1</td><td>0</td><td>8</td></tr><tr><td>P2</td><td>4</td><td>5</td></tr><tr><td>P3</td><td>3</td><td>2</td></tr><tr><td>P4</td><td>2</td><td>1</td></tr></table>Table Q.2B</td><td>(3M)
(CO4, CO3)(L2,L3)</td></tr>
<tr><td>2C.</td><td>Explain the microkernel operating system structure with diagram, benefits, and detriments.</td><td>(2M)
(CO1, L2)</td></tr>
<tr><td>3A</td><td>Apply FIFO, LRU and optimal page replacement algorithms for the following page reference string. Page reference string 7,0,1,2,0,3,0,4,2,3,0,3,2,1,2,0,1,7,0,1. 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>3B</td><td>Explain the handling of a user application invoking the open () system call with a neat diagram and state the purpose of medium-term scheduler with neat diagram.</td><td>(3M)
(CO1,L2)</td></tr>
<tr><td>3C</td><td>Explain in detail about threading and its models with neat diagram. Explain the challenges in multicore programming.</td><td>(2M)
(CO1,L2)</td></tr>
<tr><td>4A</td><td>Explain in detail about page table structure and its variation with suitable example. Define fragmentation and suggest the solution to reduce external fragmentation.</td><td>(5M)
(CO4,L2)</td></tr>
<tr><td>4B</td><td>Let the page fault service time be 10ms in a computer with average memory access time being 20ns. If one page fault is generated for every 10^6 memory accesses, what is the effective access time for the memory? List steps involved in page fault service.</td><td>(3M)
(CO4,L3)</td></tr>
<tr><td>4C</td><td>Explain sequential and direct access methods of a file with examples.</td><td>(2M)
(CO5,L2)</td></tr>
<tr><td>5A</td><td>Assume that a disk drive has cylinders numbered 0 to 4999. Cylinder 143 is currently serving by drive, and the cylinder 125 was a previous request. The 86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130 are pending requests. Suggest any two best disk-scheduling algorithms from FCFS, SSTF, SCAN, C-SCAN and C-LOOK, those uses minimum distance to satisfy all the pending requests. Justify your answer.</td><td>(5M)
(CO5,L3)</td></tr>
<tr><td>5B</td><td>Explain the any three ways of implementing the access matrix.</td><td>(3M)
(CO5,L2)</td></tr>
<tr><td>5C</td><td>Discuss the strengths and weaknesses of implementing an access matric using capabilities that are associated with domains.</td><td>(2M)
(CO5,L2)</td></tr>
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