MANGALORE INSTITUTE OF TECHNOLOGY & ENGINEERING
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Model Question Paper
Fourth Semester BE Degree Examination
Operating Systems

Time: 3 Hours **Max. Marks: 100**

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M: Marks, L: RBT (Revised Bloom's Taxonomy) level, C: Course outcomes.

<table>
<tr><th colspan="3">Module -1</th><th>M</th><th>L</th><th>C</th></tr>
<tr><td rowspan="3">Q1</td><td>a</td><td>Describe the Operating System from the user view and system view.</td><td>6</td><td>L2</td><td>CO1</td></tr>
<tr><td>b</td><td>Classify the technique used in the Dual mode operation, Multiprogramming and Multitasking systems.</td><td>8</td><td>L3</td><td>CO1</td></tr>
<tr><td>c</td><td>Demonstrate the operating system's responsibilities w.r.t process, memory and storage management.</td><td>6</td><td>L2</td><td>CO1</td></tr>
<tr><td colspan="6">OR</td></tr>
<tr><td rowspan="3">Q2</td><td>a</td><td>Demonstrate the usage of system call with an example and explain the relationship between API-System call interface-OS.</td><td>6</td><td>L2</td><td>CO1</td></tr>
<tr><td>b</td><td>Design the layered approach and the modular approach operating system structure and classify the techniques of both.</td><td>8</td><td>L3</td><td>CO1</td></tr>
<tr><td>c</td><td>Explain with a neat diagram the concept of Virtual machine model with its benefits.</td><td>6</td><td>L2</td><td>CO1</td></tr>
<tr><td colspan="6">Module- 2</td></tr>
<tr><td rowspan="3">Q3</td><td>a</td><td>Illustrate with a neat diagram the process with its state and a queuing diagram to represent process migration.</td><td>6</td><td>L2</td><td>CO2</td></tr>
<tr><td>b</td><td>Develop a tree of processes for Solaris operating system and explain. Write a program in C forking a separate process.</td><td>8</td><td>L3</td><td>CO2</td></tr>
<tr><td>c</td><td>Draw the Gantt chart and find out the completion time, average turnaround time and average waiting time for the following set of processes using FCFS, SRTF.
<table>
<tr><th>Process</th><th>Arrival Time</th><th>Burst Time</th></tr>
<tr><td>P1</td><td>0</td><td>6</td></tr>
<tr><td>P2</td><td>2</td><td>3</td></tr>
<tr><td>P3</td><td>4</td><td>3</td></tr>
<tr><td>P4</td><td>5</td><td>5</td></tr>
</table></td><td>6</td><td>L3</td><td>CO2</td></tr>
<tr><td colspan="6">OR</td></tr>
<tr><td rowspan="3">Q4</td><td>a</td><td>Discuss various models of multithreading and the relationship between user and kernel thread.</td><td>6</td><td>L2</td><td>CO2</td></tr>
<tr><td>b</td><td>Classify various methods for logical implementation of message - passing systems.</td><td>8</td><td>L3</td><td>CO2</td></tr>
<tr><td>c</td><td>Draw the Gantt chart to interpret the execution of the following processes using pre-emptive priority scheduling algorithms and Round robin (quantum = 4ms). Also calculate average waiting time and average turnaround time. (Consider the largest priority process has higher priority)
<table>
<tr><th>Process</th><th>Arrival Time</th><th>Burst Time</th><th>Priority</th></tr>
<tr><td>P1</td><td>0</td><td>6</td><td>4</td></tr>
<tr><td>P2</td><td>3</td><td>5</td><td>2</td></tr>
<tr><td>P3</td><td>3</td><td>3</td><td>6</td></tr>
<tr><td>P4</td><td>5</td><td>5</td><td>3</td></tr>
</table></td><td>6</td><td>L3</td><td>CO2</td></tr>
</table>

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Module – 3

Q5	a	Illustrate the Critical section problem and a classic software-based solution to the critical section problem.	6	L2	CO3
	b	Describe Semaphore and explain its implementation with block and wakeup operation	6	L2	CO3
	c	Apply the Banker's resource-request algorithm & identify the safety sequence of processes execution for below snapshot.	8	L3	CO3

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

If P1 request (1,0,2) & in this state P4 request (3,3,0) then identify the safety of the system.

OR

Q6	a	Classify the request and assignment edge in a Resource-allocation graph and construct the graph to show with a deadlock and with a cycle but no deadlock.	6	L2	CO3
	b	Identify various alternatives available for a system to recover from deadlock.	6	L3	CO3
	c	For the following resource-allocation state, prove that system is not in deadlock state and examine if P2 makes one additional request for instance of resource type C and justify your answer.	8	L3	CO3

Process	Allocation			Request			Available		
	A	B	C	A	B	C	A	B	C
P0	0	1	0	0	0	0	0	0	0
P1	2	0	0	2	0	2			
P2	3	0	3	0	0	0			
P3	2	1	1	1	0	0			
P4	0	0	2	0	0	2			

Module – 4

Q7	a	Explain the support of paging hardware in handling paging scheme. Given 4 pages in logical memory each of 4 bytes in size and physical memory of 32 bytes (8 pages) and index to page table is 0-5, 1-6, 2-1, 3-2, show mapping with appropriate entries.	7	L3	CO4
	b	Construct a paging hardware with TLB for a simple paging system and explain the process. Find out EAT for a 80% hit ratio, 20ns to search in TLB and 100ns to access memory.	7	L3	CO4
	c	Build a hardware setup that support segmentation in memory management scheme and show few references to bytes within segments with few example.	6	L3	CO4

OR

Q8	a	Design a hardware for handling a page fault and identify the steps in handling a page fault and compute EAT for demand page.	7	L3	CO4
	b	Given the page reference string 7 0 1 2 0 3 0 4 2 3 0 3 2 1 2 0 1 7 0 1 for a memory with 3 frames. Find the number of page faults using LRU and Optimal page replacement algorithm.	7	L3	CO4
	c	Given a system with 1kb frame size, a Student process needs 10kb, and an interactive database-127kb but the free frames are 62 only. How do you allocate the frames for both the processes?	6	L3	CO4

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Module – 5					
Q9	a	Mention various file operations and explain different file access methods.	6	L2	CO5
	b	Identify the mechanism of a linked allocation that solves the contiguous allocation problem during file allocation mechanism.	8	L3	CO5
	c	Describe Tree structured directories and Acyclic graph directories with neat diagram	6	L2	CO5
OR					
Q10	a	Explain with a neat diagram the structure of a magnetic disk.	6	L2	CO5
	b	Consider a disk queue with requests for I/O to blocks on cylinders 98, 183, 37, 122, 14, 124, 65, 67 in that order. Calculate the total head movement required to satisfy all the requests assuming current head position is at cylinder 53 using FCFS, SSTF, SCAN and C-LOOK.	8	L3	CO5
	c	Explain Bad blocks and swap space management in brief.	6	L2	CO5

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