CBCS SCHEME

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22MCA12

First Semester MCA Degree Examination, Jan./Feb. 2023
Operating System Concepts

Time: 3 hrs. Max. Marks: 100

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

		Module – 1	M	L	C
Q.1	a.	What is an operating system? Explain the various services of the operating system.	10	L1	CO1
	b.	What is a system call? Explain the different types of system calls.	10	L1	CO1
		OR			
Q.2	a.	Explain simple, layered and microkernel structures of the operating system.	10	L1	CO1
	b.	What are Virtual Machines? Explain the implementation of virtual machines.	10	L1	CO1
		Module – 2			
Q.3	a.	What is a process? Explain the five state process model with a neat diagram.	10	L1	CO1
	b.	Consider the following processes, which have arrived at the ready queue with the burst and the arrival time given in milliseconds as shown below: (see table below) Draw the Gantt chart and calculate the average waiting time using the following scheduling algorithms: (i) FCFS (ii) SJF (Preemptive) (iii) RR (Q = 4)	10	L3	CO5
		OR			
Q.4	a.	What is a process control block? Explain the use of PCB in context switching.	10	L2	CO1
	b.	What are user threads and kernel threads? Explain the various multithreading models.	10	L2	CO1
		Module – 3			
Q.5	a.	What is a critical section problem? Illustrate Peterson's two process solution for a critical section problem.	10	L2	CO2
	b.	What are Semaphores? Explain the producer-consumer problem and give a solution using semaphores.	10	L3	CO4
		OR			

Table for Q.3 b:

Process	Burst Time	Arrival Time
P1	8	0
P2	4	1
P3	9	2
P4	5	3

<table>
<tr><td>Q.6</td><td>a.</td><td>What is a deadlock? What are the necessary conditions for a deadlock to occur?</td><td>10</td><td>L2</td><td>CO2</td></tr>
<tr><td></td><td>b.</td><td>Consider the following snapshot of a system:
<table>
<tr><th></th><th colspan="3">Allocation</th><th colspan="3">Max</th><th colspan="3">Available</th></tr>
<tr><th></th><th>A</th><th>B</th><th>C</th><th>A</th><th>B</th><th>C</th><th>A</th><th>B</th><th>C</th></tr>
<tr><td>P_0</td><td>0</td><td>1</td><td>0</td><td>7</td><td>5</td><td>3</td><td>3</td><td>3</td><td>2</td></tr>
<tr><td>P_1</td><td>2</td><td>0</td><td>0</td><td>3</td><td>2</td><td>2</td><td></td><td></td><td></td></tr>
<tr><td>P_2</td><td>3</td><td>0</td><td>2</td><td>9</td><td>0</td><td>2</td><td></td><td></td><td></td></tr>
<tr><td>P_3</td><td>2</td><td>1</td><td>1</td><td>2</td><td>2</td><td>2</td><td></td><td></td><td></td></tr>
<tr><td>P_4</td><td>0</td><td>0</td><td>2</td><td>4</td><td>3</td><td>3</td><td></td><td></td><td></td></tr>
</table>
Answer the following questions using Bankers Algorithm:
(i) Construct a need matrix.
(ii) Is the system in a safe state? If yes, what is the safe sequence?
(iii) If process P_1 makes a request (1, 0, 2), can the request be granted?</td><td>10</td><td>L3</td><td>CO5</td></tr>
<tr><td colspan="6">Module – 4</td></tr>
<tr><td>Q.7</td><td>a.</td><td>Write a C program to simulate the multiprogramming with variable member of tasks (MVT) memory management technique. Given the size of the memory, size of OS, number of processes and size of each process, calculate the external fragmentation.</td><td>10</td><td>L3</td><td>CO5</td></tr>
<tr><td></td><td>b.</td><td>What is Paging? Explain the paging hardware with a neat diagram.</td><td>10</td><td>L2</td><td>CO5</td></tr>
<tr><td colspan="6">OR</td></tr>
<tr><td>Q.8</td><td>a.</td><td>What is demand paging? Explain how demand paging can be implemented.</td><td>10</td><td>L2</td><td>CO5</td></tr>
<tr><td></td><td>b.</td><td>Consider the following reference string:7 0 1 2 0 3 0 4 2 3 0 3 2 1 2 0 1 7 0 1
How many page faults would occur in case of the following page replacement algorithms: (i) Optimal (ii) LRV?
Assuming 3 frames. Note : Initially all frames are empty.</td><td>10</td><td>L3</td><td>CO3</td></tr>
<tr><td colspan="6">Module – 5</td></tr>
<tr><td>Q.9</td><td>a.</td><td>What are the various access methods used for accessing files?</td><td>10</td><td>L2</td><td>CO5</td></tr>
<tr><td></td><td>b.</td><td>Explain the various directory structures with neat diagrams.</td><td>10</td><td>L2</td><td>CO5</td></tr>
<tr><td colspan="6">OR</td></tr>
<tr><td>Q.10</td><td>a.</td><td>Write a note on different file allocation methods.</td><td>10</td><td>L2</td><td>CO5</td></tr>
<tr><td></td><td>b.</td><td>Show how free space management is done using:
(i) Bit vector (ii) Linked list (iii) Grouping (iv) Counting</td><td>10</td><td>L3</td><td>CO5</td></tr>
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