Enrollment No.....................................

Faculty of Science / Engineering

End Sem Examination May-2024

CA3CO12 Operating System

Programme: BCA / BCA -   Branch/Specialisation: Computer

MCA (Integrated)   Application

Duration: 3 Hrs.   **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

Q.1 i. Which of the following is NOT a type of operating system?   **1**
        (a) Batch   (b) Real Time
        (c) Standalone   (d) Multiprocessing

    ii. What is the primary function of an operating system?   **1**
        (a) Managing hardware components
        (b) Providing a user interface
        (c) Communication between software applications
        (d) All of these

    iii. Which scheduling algorithm allows processes to execute in a circular **1**
         manner with each process getting a small unit of CPU time?
        (a) FCFS
        (b) Round robin
        (c) SJF
        (d) Priority Scheduling

    iv. What is the purpose of a context switch in process management?   **1**
        (a) To terminate a process
        (b) To suspend a process
        (c) To switch between processes
        (d) To create a new process

    v.   What is the purpose of semaphores in process synchronization?   **1**
        (a) To prevent deadlock
        (b) To coordinate access to shared resources
        (c) To suspend a process
        (d) To terminate a process

vi. What classical problem of synchronization involves multiple **1** processes trying to read and write to a shared buffer?
(a) Bounded buffer problem
(b) Dining Philosophers problem
(c) Readers & writers problem
(d) Critical section problem

vii. What is the purpose of address binding in memory management? **1**
(a) To map logical addresses to physical addresses
(b) To allocate memory space to processes
(c) To assign logical addresses to processes
(d) To manage memory fragmentation

viii. What is the purpose of demand paging in virtual memory **1** management?
(a) To reduce memory fragmentation
(b) To increase system performance by preloading processes into memory
(c) To allocate memory space dynamically
(d) To load only the necessary pages into memory when needed

ix. What is the primary purpose of a file system? **1**
(a) To manage CPU resources
(b) To manage memory allocation
(c) To organize and store data on storage devices
(d) To manage network connections

x. What is the primary goal of disk scheduling algorithms in file **1** systems?
(a) To maximize CPU utilization
(b) To minimize disk space usage
(c) To optimize disk access and reduce seek time
(d) To prevent data loss

Q.2 i. What is the role of kernel and shell in operating system? **2**
ii. Analyze the evolution of operating systems from the early days of **8** computing to the present.
OR iii. Discuss the key components of an operating system and their **8** interdependencies.

Q.3 i. What is a Process Control Block (PCB)? Describe its contents. **3**
ii. Consider the set of 5 processes whose arrival time and burst time are **7** given below (See Table1)-
If the CPU scheduling policy is Round Robin with time quantum = 2 unit, calculate the average waiting time and average turnaround time. Also draw a Gantt chart for both ready and running queue.

Table 1

Process Id	Arrival time	Burst time
P1	0	5
P2	1	3
P3	2	1
P4	3	2
P5	4	3

OR iii. Describe the concept of process state transitions and their significance **7** in process management.

Q.4 i. Describe the necessary conditions for deadlock. **4**
ii. How the Banker's algorithm ensures safe state and prevents deadlock **6** in resource allocation? Explain with example.
OR iii. Discuss the critical section problem and the role of semaphores in **6** addressing it.

Q.5 i. Discuss the issues of fragmentation in memory allocation. **4**
ii. Consider a reference string: 4, 7, 6, 1, 7, 6, 1, 2, 7, 2. **6**
The number of frames in the memory is 3. Find out the number of page faults (with its memory representation table) respective to Optimal, FIFO and LRU Page Replacement Algorithms.
OR iii. Describe the concept of virtual memory and its implementation in **6** operating systems.

Q.6 Attempt any two:
i. Discuss the structure and organization of a file system and Disk in **5** operating systems.
ii. Describe the various allocation methods for file storage, including **5** contiguous and linked allocation.
iii. Analyze the different disk scheduling algorithms and their impact on **5** system performance.

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Marking Scheme

Operating System (T)- CA3CO12 (T)

Q.1 i) c) Standalone   1

ii) d) All of the above   1

iii) b) Round Robin   1

iv) c) To switch between processes   1

v) b) To coordinate access to shared resources   1

vi) c) Readers & writers problem   1

vii a) To map logical addresses to physical addresses   1

vii d) To load only the necessary pages into memory when needed   1

ix) c) To organize and store data on storage devices   1

x) c) To optimize disk access and reduce seek time   1

Q.2	i.	Role of kernel	1Marks	2
		Role of shell	1 Marks	
	ii.	The evolution of operating systems	8 Marks	8
OR	iii.	key components of an operating system	6 Marks	8
		Interdependencies	2 Marks	

Q.3	i.	What is PCB	1 Marks	3
		Its contents	2 Marks	
	ii.	Gantt Chart =		
		Ready Queue-1.5 Marks, Running Queue=1.5 Marks =	3 Marks	

Average Turn Around time = (13 + 11 + 3 + 6 + 10) / 5 = 43 / 5 = 8.6 unit=   2 Marks

Average waiting time = (8 + 8 + 2 + 4 + 7) / 5 = 29 / 5 = 5.8 unit= (2 Marks)

OR	iii.	Concept of process state transitions	5 Marks	7
		Its significance	2 Marks	

Q.4	i.	Four necessary conditions for deadlock	4 Marks	4
	ii.	Banker's algorithm	4 Marks	6
		Example	2 Marks	
OR	iii.	critical section problem	2 Marks	6
		role of semaphores	4 Marks	

Q.5	i.	issues of fragmentation (Internal)	2 Marks	4
		issues of fragmentation (External)	2 Marks	
	ii.	No. of Page Faults in optimal = 5,	2 Marks	6
		No. of Page Faults in LRU = 6 ,	2 Marks	
		No. of Page Faults in FIFO =6,	2 Marks	
OR	iii.	Concept of virtual memory	2 Marks	6
		Implementation	4 Marks	

6	i.	structure and organization of a file	2.5 Marks	5
		structure and organization of a Disk	2.5 Marks	
	ii.	Contiguous allocation method	2.5 Marks	5
		Linked allocation method	2.5 Marks	
	iii.	disk scheduling algorithms	3 Marks	5
		Impact	2 Marks	

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