



BRAINWARE UNIVERSITY

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Brainware University
398, Ramkrishnapur Road, Barasat
Kolkata, West Bengal-700125

Term End Examination 2024-2025

Programme – BCA-Hons-2023

Course Name – Operating System

Course Code - BCA30110

(Semester III)

Full Marks : 60

Time : 2:30 Hours

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question)

1 x 15=15

1. Choose the correct alternative from the following :

- (i) What is the primary function of an operating system?
 - a) Manage hardware resources
 - b) Manage application programs
 - c) Manage memory
 - d) All of the these
- (ii) Which of the following is an example of a system call?
 - a) open()
 - b) print()
 - c) scanf()
 - d) printf()
- (iii) Which type of operating system is designed for systems that require real-time processing?
 - a) Batch operating system
 - b) Multi-user operating system
 - c) Real-time operating system
 - d) Distributed operating system
- (iv) Which type of operating system allows multiple users to run programs simultaneously?
 - a) Single-user operating system
 - b) Multi-user operating system
 - c) Real-time operating system
 - d) Distributed operating system
- (v) Which operating system is known for its use in servers?
 - a) Windows
 - b) Linux
 - c) macOS
 - d) Android
- (vi) Which type of operating system is specifically designed for embedded systems?
 - a) Multi-user operating system
 - b) Real-time operating system
 - c) Distributed operating system
 - d) Embedded operating system
- (vii) Identify the type of inter-process communication is best for small, quick data exchanges?
 - a) Message Passing
 - b) Shared Memory
 - c) Signals
 - d) Pipes
- (viii) Identify the key disadvantage of contiguous memory allocation.
 - a) Fragmentation
 - b) Slow access speed
 - c) High CPU overhead
 - d) Complex management

- (ix) Suppose P, Q and R are cooperating processes satisfying Mutual Exclusion conditions. Then if the process Q is executing in its critical section, then
- P' executes in a critical section
 - R' executes in a critical section
 - Neither 'P' nor 'Q' executes in their critical section
 - Both 'P' and 'R' execute in critical section
- (x) Select the outcome that occurs, when a process tries to access a page not currently in main memory of the system (Assume that system support virtual memory)
- A page fault occurs, and the page is loaded from the disk
 - The process terminates due to a memory violation
 - The process waits until the page becomes available
 - The page is automatically reallocated from other processes
- (xi) Select the data structure commonly used in most operating systems to keep track of a process's execution state.
- Process Control Block (PCB)
 - Semaphore
 - Resource Allocation Graph
 - Interrupt Service Routine
- (xii) Choose the technique commonly used to reduce external fragmentation in memory management.
- Paging
 - Segmentation
 - Contiguous Allocation
 - Swapping
- (xiii) Select the most suitable job scheduling algorithm, best suitable for time sharing systems.
- SJN
 - Round Robin
 - FCFS
 - Priority Scheduling
- (xiv) Revise the page replacement algorithm based on the frequency of page use.
- FIFO
 - LRU
 - LFU
 - CLOCK
- (xv) Select the situation in which a process is in a blocked state.
- Ready to run but waiting for a signal
 - Waiting for an I/O operation to complete
 - Allocating additional memory to a process
 - Moving a process between user and kernel modes

Group-B

(Short Answer Type Questions)

3 x 5=15

- Identify the differences between command-line interfaces (CLI) and graphical user interfaces (GUI). (3)
- Describe OS, User Space and Kernel Space. (3)
- Given the following processes, use preemptive priority scheduling to compute the waiting time for Process P3. (3)

	Process Arrival Time (ms)	Burst Time (ms)	Priority (1 = Highest)
P1	0	8	2
P2	1	4	1
P3	2	9	3
P4	3	5	2

- Given the reference string: 7,0,1,2,0,3,0,4,2,3,0,3,2 With 3 page frames, use the FIFO page replacement algorithm to identify the number of page faults. (3)
- Explain Round-Robin and Priority Scheduling algorithm with an example. (3)

OR

Analyze how the concept of ageing addresses the problem of process starvation in Priority Scheduling. (3)

Group-C
(Long Answer Type Questions)

5 x 6=30

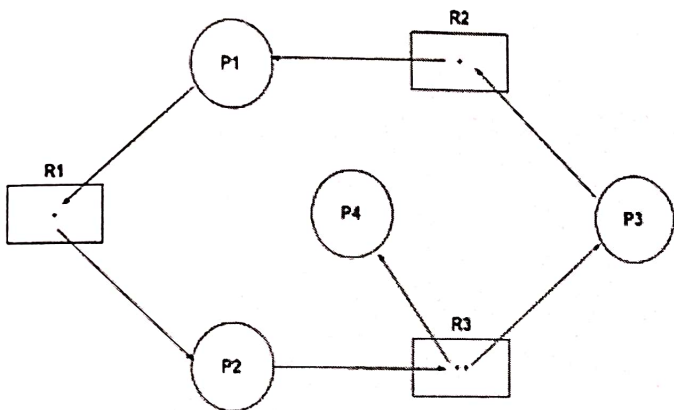
7. Given CPU time slice of 2ms and the following list of processes. (5)

Process	Burst time (ms)	Arrival time (ms)
P ₁	3	0
P ₂	4	2
P ₃	5	5

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Find average turnaround time and average waiting time of the CPU for round-robin CPU scheduling?

8. Explain the key concept of starvation? Give an example of starvation. (5)
9. Based on the following Resource allocation graph, explain whether a deadlock will occur or not. If no deadlock occurs, what are the possible process sequences? (5)



10. (5)

Process	Allocation				MAX ABCD				Available ABCD			
	A	B	C	D	A	B	C	D	A	B	C	D
P0	0	0	1	2	0	0	1	2	1	5	2	0
P1	1	0	0	0	1	7	5	0				
P2	1	3	5	4	2	3	5	6				
P3	0	6	3	2	0	6	5	2				
P4	0	0	1	4	0	6	5	6				

Evaluate the following questions using the banker's algorithm:

- What is the content of the matrix need?
- Is the system in a safe state? Justify.
- If a request from process P1 for (0,4,2,0) can the request be granted immediately? Answer with justification.

11. Analyse the following processes, scheduled as per Shortest Job First scheduling algorithm. (5)

Process	Arrival Time	Burst Time
P1	0	8
P2	4	5
P3	6	3
P4	8	2

What is the difference between average turnaround time and average waiting time?

12. Examine the role of virtual machines in operating system design. (5)

OR

- Compare the architectures of single-tasking and multitasking operating systems. (5)