



# Faculty of Science / Engineering

## End Semester Examination May 2025

### CA3CO12 Operating System

<b>Programme</b>	<b>:</b>	BCA / BCA-MCA (Integrated)	<b>Branch/Specialisation</b>	<b>:</b>	-
<b>Duration</b>	<b>:</b>	3 hours	<b>Maximum Marks</b>	<b>:</b>	60

**Note:** All questions are compulsory. Internal choices, if any, are indicated. Assume suitable data if necessary. Notations and symbols have their usual meaning.

<b>Section 1 (Answer all question(s))</b>		<b>Marks</b>	<b>CO</b>	<b>BL</b>
<b>Q1.</b>	What OS service allows efficient management of input/output devices?	<b>1</b>	<b>1</b>	<b>1</b>
	<input checked="" type="radio"/> I/O System Management <input type="radio"/> Program Execution <input type="radio"/> File Management <input type="radio"/> Communication Control			
<b>Q2.</b>	Which type of OS allows multiple users to use the system simultaneously?	<b>1</b>	<b>1</b>	<b>2</b>
	<input type="radio"/> Single-user OS <input checked="" type="radio"/> Multi-user OS <input type="radio"/> Real-time OS <input type="radio"/> Embedded OS			
<b>Q3.</b>	What is the purpose of a context switch in process management?	<b>1</b>	<b>2</b>	<b>1</b>
	<input type="radio"/> To terminate a process <input type="radio"/> To suspend a process <input checked="" type="radio"/> To switch between processes <input type="radio"/> To create a new process			
<b>Q4.</b>	Which of the following is NOT a CPU scheduling criterion?	<b>1</b>	<b>2</b>	<b>2</b>
	<input type="radio"/> Turnaround Time <input type="radio"/> Response Time <input type="radio"/> Dispatch Latency <input checked="" type="radio"/> File Access Time			
<b>Q5.</b>	Which of the following is a necessary condition to solve the critical section problem?	<b>1</b>	<b>3</b>	<b>1</b>
	<input checked="" type="radio"/> Mutual exclusion <input type="radio"/> Non-preemptive scheduling <input type="radio"/> Process synchronization <input type="radio"/> Circular waiting			
<b>Q6.</b>	Which of the following is an example of deadlock prevention?	<b>1</b>	<b>3</b>	<b>1</b>
	<input checked="" type="radio"/> Ensure processes don't hold multiple resources simultaneously <input type="radio"/> Allow all processes to run in parallel <input type="radio"/> Increase resource availability <input type="radio"/> Allocate resources randomly			
<b>Q7.</b>	Which of the following happens during compile-time address binding?	<b>1</b>	<b>4</b>	<b>2</b>
	<input type="radio"/> Memory addresses are bound when the program is executed <input type="radio"/> Memory addresses are bound when the program is loaded into memory <input type="radio"/> Memory addresses are assigned by the OS dynamically at runtime <input checked="" type="radio"/> The program's address space is independent of the actual physical memory			
<b>Q8.</b>	Which of the following is true for contiguous memory allocation?	<b>1</b>	<b>4</b>	<b>1</b>
	<input type="radio"/> The system can allocate memory dynamically <input checked="" type="radio"/> The process needs to be loaded into contiguous memory locations <input type="radio"/> It eliminates external fragmentation <input type="radio"/> Processes are isolated in separate memory blocks			

- Q9.** Which of the following is a main advantage of the indexed file structure? 1    5    1
- ☐ Fast sequential access to records                      ☒ Direct access to records via an index  
☐ Easy to implement    ☐ Simple management of files
- Q10.** Bit vector representation is most useful when- 1    5    2
- ☒ There are many free and occupied blocks in memory                      ☐ Efficient memory access is critical  
☐ A large number of small files need to be stored                      ☐ Memory fragmentation is severe

**Section 2 (Answer all question(s))**

**Marks CO BL**

- Q11.** Define the term "kernel" in the context of an operating system. How does it manage system resources? 4    1    1

Rubric	Marks
Definition of Kernel 2 Mark	4
Manage system resources 2 Mark	

- Q12. (a)** Explain the key features of batch processing, multi programming, and time-sharing systems in the context of operating system evolution. 6    1    1

Rubric	Marks
batch processing 2 Mark	6
multi programming 2 Mark	
time-sharing systems 2 Mark	

(OR)

- (b)** What is a network operating system? Discuss its features and the benefits it provides in a networked environment.

Rubric	Marks
Definition network operating 2 Mark	6
Features 2 Mark	
Benefits 2 Mark	

**Section 3 (Answer all question(s))**

**Marks CO BL**

- Q13.** Explain process state transitions briefly. 3    2    2

Rubric	Marks
Process state transitions 2 Mark	3
Diagram 1 Mark	

- Q14. (a)** Consider the set of 5 processes whose arrival time and burst time are given in below table-  
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.

7 3 2

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

Rubric	Marks
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)	7

(OR)

- (b)** Discuss Multilevel Queue and Multilevel Feedback Queue Scheduling with examples.

Rubric	Marks
Multilevel Queue with example 3.5 Mark Multilevel Feedback with example 3.5 Mark	7

#### Section 4 (Answer any 2 question(s))

Marks CO BL

- Q15.** What is synchronization in operating systems? Explain why synchronization is necessary in multi-process systems.

5 3 2

Rubric	Marks
synchronization 3 Mark why synchronization necessary 2 Mark	5

- Q16.** Explain how the critical section problem is handled in operating systems. Discuss any widely used algorithms for solving this problem.

5 3 1

Rubric	Marks
critical section problem 2 Mark algorithms 3 Mark	5

- Q17.** How the Banker's algorithm ensures safe state and prevents deadlock in resource allocation? Explain with example.

5 3 2

Rubric	Marks
Explain Banker's algorithm 2 Mark Example 3 Mark	5

#### Section 5 (Answer all question(s))

Marks CO BL

**Q18.** Explain the purpose of swapping in memory management.

2 4 2

Rubric	Marks
Purpose of swapping 2 Mark	2

**Q19.** Explain external fragmentation with an example.

3 4 1

Rubric	Marks
Definition External fragmentation 2 Mark Example 1 Mark	3

**Q20. (a)** Given the following page reference string:

5 4 1

7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1

The number of frames in the memory is 3. Find out the number of page faults (with its memory representation table) respective to  
FIFO and LRU Page Replacement Algorithms.

Rubric	Marks
No. of Page Faults in LRU =12 2.5 Marks No. of Page Faults in FIFO =15 2.5 Marks	5

(OR)

**(b)** Define demand paging and explain how it improves memory utilization.

Rubric	Marks
Demand paging 2.5 Marks Improves memory utilization 2.5 Marks	5

### Section 6 (Answer all question(s))

Marks CO BL

**Q21.** What is contiguous allocation? Discuss its advantages and disadvantages.

4 4 1

Rubric	Marks
Contiguous allocation 2 Mark Advantages and disadvantages 2 Mark	4

**Q22. (a)** Compare and contrast SCAN, C-SCAN, LOOK, and C-LOOK disk scheduling algorithms.

6 4 2

Rubric	Marks
Each algorithms 2 Mark	6

(OR)

**(b)** Explain sequential and direct access methods with suitable examples.

Rubric	Marks
Sequential access methods 3 Mark Direct access methods 3 Mark	6

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