

Faculty of Engineering / Science

End Semester Examination May 2025

CS3CO36 / BC3CO62 Operating Systems

Programme	:	B.Tech. / B. Sc.	Branch/Specialisation	:	CS
Duration	:	3 hours	Maximum Marks	:	60

Note: All questions are compulsory. Internal choices, if any, are indicated. Assume suitable data if necessary.

Notations and symbols have their usual meaning.

Section 1 (Answer all question(s))				Marks CO BL
Q1. Which type of OS is designed for systems that require immediate processing and response?				1 1 1
<input checked="" type="radio"/> Real-Time <input type="radio"/> Time-Sharing	<input type="radio"/> Distributed <input type="radio"/> Parallel			
Q2. What is used for communication between processes in an OS?				1 1 1
<input type="radio"/> File System <input type="radio"/> Process Table	<input checked="" type="radio"/> Inter-Process Communication <input type="radio"/> Interrupts			
Q3. Which condition is NOT necessary for a deadlock to occur?				1 3 2
<input type="radio"/> Mutual Exclusion <input type="radio"/> Hold and Wait	<input checked="" type="radio"/> Preemption <input type="radio"/> Circular Wait			
Q4. Which scheduling algorithm allows a process to be interrupted and moved back to the ready queue before completion?				1 3 2
<input checked="" type="radio"/> Round Robin <input type="radio"/> FCFS	<input type="radio"/> SJF <input type="radio"/> None of these			
Q5. Which memory allocation strategy selects the smallest available partition that fits the process?				1 4 1
<input type="radio"/> First-fit <input checked="" type="radio"/> Best-fit	<input type="radio"/> Worst-fit <input type="radio"/> All of the above			
Q6. Which memory management technique divides memory into fixed-size blocks?				1 4 2
<input type="radio"/> Segmentation <input checked="" type="radio"/> Paging	<input type="radio"/> Swapping <input type="radio"/> Partitioning			
Q7. Which page replacement algorithm replaces the page that will not be used for the longest period of time?				1 5 1
<input type="radio"/> Least recently used <input checked="" type="radio"/> Optimal	<input type="radio"/> FIFO <input type="radio"/> All of the above			
Q8. Which phenomenon occurs when excessive paging reduces CPU utilization?				1 5 1
<input checked="" type="radio"/> Thrashing <input type="radio"/> Segmentation	<input type="radio"/> Fragmentation <input type="radio"/> Swapping			
Q9. Which disk scheduling algorithm selects the request with the shortest seek time first?				1 5 2
<input checked="" type="radio"/> SSTF <input type="radio"/> SCAN	<input type="radio"/> FCFS <input type="radio"/> None			
Q10. Which file allocation method links file blocks in a linked list?				1 5 1
<input type="radio"/> Contiguous <input type="radio"/> Indexed	<input checked="" type="radio"/> Linked <input type="radio"/> Hybrid			

Section 2 (Answer all question(s))**Marks CO BL****Q11.** Define an operating system and mention any two primary functions of an OS.

2 1 2

Rubric	Marks
Definition	1
Functions of OS	1

Q12. Differentiate between a batch operating system and a time-sharing operating system with one example for each.

Rubric	Marks
Difference between batch and time sharing operating system	2
Example of each.	1

Q13. (a) What is the Critical Section Problem? Explain with an example and mention two solutions to avoid it.

Rubric	Marks
Definition of Critical Section.	2
Example	2
Solutions	1

(OR)**(b)** Explain process scheduling in an operating system? Also define long-term scheduler, short-term scheduler, and medium-term scheduler.

Rubric	Marks
Definition of Process Scheduling	2
long-term scheduler, short-term scheduler, and medium-term scheduler.	3

Section 3 (Answer all question(s))**Marks CO BL****Q14.** Define deadlock and mention the four necessary conditions for its occurrence.

Rubric	Marks
Deadlock Definition	1
four necessary conditions	1

Q15. (a) Consider the set of 5 processes whose arrival time and burst time are given below-

8 3 3

Process Id	Arrival time	Burst time
P1	3	1
P2	1	4
P3	4	2
P4	0	6
P5	2	3

Calculate the average waiting time and turnaround time using Shortest Job First Scheduling and Round Robin Scheduling (time quantum = 2).

Rubric	Marks
Formula	1
Shortest Job First Scheduling	3.5
Round Robin Scheduling	3.5

(OR)

(b) Consider the following snapshot of the system:

Process	Allocation			Max			Available		
	R1	R2	R3	R1	R2	R3	R1	R2	R3
P1	0	1	0	7	5	3	3	3	2
P2	2	0	0	3	2	2			
P3	3	0	2	9	0	2			
P4	2	1	1	2	2	2			
P5	0	0	2	4	3	3			

Answer the following questions using the Banker's Algorithm:

- (i) Find out the need matrix.
- (ii) Is the system in safe state or not.

Rubric	Marks
need matrix.	3
Safe State and Safe Sequence	5

Section 4 (Answer all question(s))

Marks CO BL

3 4 2

Q16. Differentiate between logical and physical address space in memory management.

Rubric	Marks
atleast five differences	3

- Q17. (a)** Given five memory partitions of 100Kb, 500Kb, 200Kb, 300Kb, 600Kb (in order), how would the first-fit, best-fit, and worst-fit algorithms place processes of 212 Kb, 417 Kb, 112 Kb, and 426 Kb (in order)? Which algorithm among First fit , Best Fit and worst fit makes the most efficient use of memory?

7 3 3

Rubric	Marks
Calculations	7

(OR)

- (b)** Explain the concept of paging with segmentation with appropriate example.

Rubric	Marks
Diagram	2
Description	5

Section 5 (Answer all question(s))

Marks CO BL

4 3 1

- Q18.** What is thrashing? Explain its causes and how it can be prevented.

Rubric	Marks
Definition	2
Causes and Prevention	2

- Q19. (a)** Explain the role of the operating system in ensuring system security. How does it help in preventing security breaches?

6 5 1

Rubric	Marks
Role of OS in system security	3
prevention from security breaches	3

(OR)

- (b)** A system uses 3 page frames for storing process pages in main memory. It uses the First in First out (FIFO) and Least Recently Used (LRU) page replacement policy. Assume that all the page frames are initially empty. What is the total number of page faults using FIFO and LRU, that will occur while processing the page reference string given below-

4 , 7, 6, 1, 7, 6, 1, 2, 7, 2

Also calculate the hit ratio and miss ratio.

Rubric	Marks
Number of Page faults findings	4
Hit Ratio and Miss ratio calculations	2

Section 6 (Answer any 2 question(s))

Marks CO BL

5 4 4

- Q20.** Consider a disk queue with requests for I/O to blocks on cylinders 98, 183, 41, 122, 14, 124, 65, 67. The FCFS scheduling algorithm is used. The head is initially at cylinder number 53. The cylinders are numbered from 0 to 199. Calculate the total head movement (in number of cylinders).

Rubric	Marks
Number of head moves and diagram	5

- Q21.** Describe the file protection mechanisms used in modern operating systems to ensure data security.

5 4 2

Rubric	Marks
Description of mechanism	5

Q22. Discuss different file allocation methods and compare their advantages and disadvantages.

5 5 2

Rubric	Marks
File Allocation methods	3
Advantages and disadvantages	2
