

K. J. Somaiya Institute of Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)

July/Aug ~~May~~ June 2025
 B. Tech Program: **Artificial Intelligence & Data Science** Scheme: **IIB**
Suppl. ~~KT~~ Examination: **SY** Semester: **IV**
 Course Code: **AIC404** and Course Name: **Operating System**
 Date of Exam: ~~26/05/25~~ *04/08/25* Duration: 02.5 Hours Max. Marks: 60

Instructions:
 (1) All questions are compulsory.
 (2) Draw neat diagrams wherever applicable.
 (3) Assume suitable data, if necessary.

Q. No.	Question	Max. Marks	CO	BT level								
Q 1	Solve any two questions out of three: (05 marks each)	10										
a)	List and explain different structures of the operating system.		CO1	Un								
b)	Explain Race condition in Producer consumer Problem with suitable example.		CO3	Un								
c)	Explain thread and its types with suitable examples.		CO2	Un								
Q 2	Solve any two questions out of three: (05 marks each)	10										
a)	Explain types of I/O devices.		CO6	Un								
b)	Explain paging with a suitable diagram.		CO4	Un								
c)	Explain file access methods.	CO5	Un									
Q.3	Solve any two questions out of three. (10 marks each)	20										
a)	Define the terms Kernel, Shell, and System Call in the context of an operating system. Explain the role of System Calls in enabling user-level programs to access OS services. Illustrate your answer with an example of any two system calls.		CO1	Un								
b)	For the given reference string: 5,3,2,1,2,4,5,6,8,4,7,3,2,1 <ul style="list-style-type: none"> • Calculate the number of page faults using the FIFO page replacement algorithm • Calculate the number of page faults using the LRU page replacement algorithm • (Consider Number of Frames: 3) 		CO4	Ap								
c)	<table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th style="width: 30%;">Process</th> <th style="width: 30%;">Arrival Time</th> <th style="width: 40%;">Burst Time</th> </tr> </thead> <tbody> <tr> <td>P1</td> <td style="text-align: center;">0</td> <td style="text-align: center;">6</td> </tr> <tr> <td>P2</td> <td style="text-align: center;">1</td> <td style="text-align: center;">4</td> </tr> </tbody> </table>	Process	Arrival Time	Burst Time	P1	0	6	P2	1	4	CO2	Ap
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	<table border="1"> <tr><td>P3</td><td>2</td><td>9</td></tr> <tr><td>P4</td><td>4</td><td>5</td></tr> <tr><td>P5</td><td>3</td><td>6</td></tr> </table> <p>Apply i) First-Come-First-Serve (FCFS) ii) Round Robin algorithm with quantum time = 3, to the following set of processes and compare their performance.</p> <ul style="list-style-type: none"> Construct Gantt charts Calculate Completion Time (CT), Turnaround Time (TAT), and Waiting Time (WT) for each process 	P3	2	9	P4	4	5	P5	3	6																																																														
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a)	What is Semaphore? Explain with suitable example use of semaphore to solve critical section problems.		CO3 Un																																																																					
b)	<p>Consider the following snapshot of a system:</p> <table border="1"> <thead> <tr> <th rowspan="2">Process</th> <th colspan="3">Allocated</th> <th colspan="3">Max</th> <th colspan="3">Available</th> </tr> <tr> <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> </thead> <tbody> <tr><td>P0</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>P1</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>P2</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>P3</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>P4</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> </tbody> </table> <p>Answer the following questions using the banker's algorithm:</p> <ol style="list-style-type: none"> Calculate Need a matrix? Is the system in a safe state If a request from process P₁ arrives for (1, 2, 2), can the request be granted immediately 	Process	Allocated			Max			Available			A	B	C	A	B	C	A	B	C	P0	0	1	0	7	5	3	3	3	2	P1	2	0	0	3	2	2				P2	3	0	2	9	0	2				P3	2	1	1	2	2	2				P4	0	0	2	4	3	3					CO4 Ap
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c)	Perform the analysis FCFS, SSTF, SCAN, CLOOK for the following sequence of disk track requests: 45,94,128,105,88,92,138,159,184. Assume that the disk head is initially positioned over track 58.		CO6 Ap																																																																					
