BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: IMSC **SEMESTER : VI**
BRANCH: Maths & Comp **SESSION : SP/2024**

SUBJECT: CS303-OPERATING SYSTEM

TIME: 3 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	What is the purpose of system calls, and how do system calls relate to the OS and to the concept of dual-mode (user-mode and kernel-mode) operation?	[5]	1	2
Q.1(b)	What are the differences between user level threads and kernel supported threads? Under what circumstances is one type "better" than the other?	[5]	1	2
Q.2(a)	Explain the concept of multiple-processor scheduling.	[5]	2	3
Q.2(b)	Consider the following set of processes, with the length of the CPU burst given in milliseconds:	[5]	2	3

Process	Burst Time	Priority
P1	10	3
P2	1	1
P3	2	3
P4	1	4
P5	5	2

The processes are assumed to have arrived in the order P1, P2, P3, P4, P5, all at time 0.

i. Draw four Gantt charts that illustrate the execution of these processes using the following scheduling algorithms: FCFS, SJF, non preemptive priority (a larger priority number implies a higher priority), and RR (quantum = 2)
ii. What is the waiting time of each process for each of these scheduling algorithms in part i ?

			CO	BL
Q.3(a)	What is critical-section problem? Explain the solution of the critical-section problem.	[5]	3	2
Q.3(b)	Consider the following snapshot of a system:	[5]	3	3

	Allocation A B C D	Max A B C D	Available A B C D
T0	0 0 1 2	0 0 1 2	1 5 2 0
T1	1 0 0 0	1 7 5 0	
T2	1 3 5 4	2 3 5 6	
T3	0 6 3 2	0 6 5 2	
T4	0 0 1 4	0 6 5 6	

Answer the following questions using the banker's algorithm:

a. What is the content of the matrix Need?
b. Is the system in a safe state?
c. If a request from thread T1 arrives for (0,4,2,0), can the request be granted immediately?

			CO	BL
Q.4(a)	What is the difference between internal and external fragmentation? Discuss the possible solutions to the external-fragmentation problem.	[5]	4	2
Q.4(b)	A process contains eight virtual pages on disk and is assigned a fixed allocation of four page frames in main memory. The following page trace occurs: 1, 0, 2, 2, 1, 7, 6, 7, 0, 1, 2, 0, 3, 0, 4, 5, 1, 5, 2, 4, 5, 6, 7, 6, 7, 2, 4, 2, 7, 3, 3, 2, 3	[5]	4	3

i. Show the successive pages residing in the four frames using the LRU replacement policy. Compute the hit ratio in main memory. Assume that the frames are initially empty.
ii. Repeat part (i) for the FIFO replacement policy.

			CO	BL
Q.5(a)	Define basic disk I/O parameters with design objectives. Explain how these parameters are relevant to different disk scheduling algorithms?	[5]	5	1
Q.5(b)	Explain in brief the file allocation methods with their merits and demerits.	[5]	5	2