BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION SP/2024)

CLASS: B.TECH. **SEMESTER : IV**
BRANCH: CS **SESSION : SP/2024**

SUBJECT: CS239 OPERATING SYSTEM

TIME: 02 Hours **FULL MARKS: 25**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates**

			CO	BL
Q.1(a)	There are two modes in which the operating system runs programs user and kernel modes, respectively. Explain how user mode is different from kernel mode and the mechanism of mode switch.	[2]	1	2
Q.1(b)	What is a simple multiprogramming system? Describe the additional responsibilities of the OS in a simple multiprogramming system over a uni-programming system? What is degree of multiprogramming?	[3]	1	2
Q.2(a)	In a pure user-level thread implementation, a multithreaded application cannot take advantage of multiprocessing. Write what is meant by pure user-level thread implementation and then explain the given statement.	[2]	2	2
Q.2(b)	Briefly describe any 4 functional components of a general-purpose Operating System? Describe the data structure used by the OS to store process details?	[3]	1	2
Q.3(a)	With the help of a diagram show the queues used in the state transition of process and the respective schedulers involved.	[2]	2	2
Q.3(b)	Consider three processes (P1, P2, and P3), all arriving at time zero, with 10, 20, and 30-time units of execution respectively. P1 spends the first 50% of execution time doing I/O, the next 30% of time doing computation, and the last 20% of time doing I/O again, but P2 and P3 spend the first 20% of execution time doing I/O, the next 70% of time doing computation, and the last 10% of time doing I/O again. The operating system uses the shortest remaining compute time first scheduling and schedules a new process either when the running process finishes its compute burst or when the running process gets blocked on I/O. Assume that all I/O operations can be overlapped. For what percentage of time does the CPU remain idle and normalized turn-around time?	[3]	2	3
Q.4(a)	What is processor affinity in multiprocessor scheduling? Why is it important? Is it achieved in gang scheduling?	[2]	2	4
Q.4(b)	Describe the load sharing multiprocessor scheduling algorithm? Discuss the possible issue(s) with the load sharing implementation and the limitations when application programs have multiple threads of execution.	[3]	2	4
Q.5(a)	What are the 2 types of concurrent execution of processes? Give an example to illustrate the problem that can arise with concurrent execution.	[2]	3	2
Q.5(b)	Write the Peterson algorithm for mutual exclusion. Justify its correctness.	[3]	3	5

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