BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION SP2023)

CLASS: BTECH
BRANCH: CSE/IT

SEMESTER : IV
SESSION : SP2023

SUBJECT: CS241 DESIGN AND ANALYSIS OF ALGORITHM

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

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			CO	BL
Q.1	What is the significance of Asymptotic Notations in Design and Analysis of an algorithm? Illustrate O, Ω, Θ notations in term of Time Complexity with suitable examples.	[5]	CO1, CO2	BL3
Q.2	Derive the Best Case and Worst-Case Time Complexity of Insertion Sort and prove that Insertion Sort is stable.	[5]	CO1, CO2	BL4, BL5
Q.3	State and explain the Master Theorem. Solve the following recurrence relations using Master Theorem. $T(n) = 2\,T(n/2) + n / \log n$ $T(n) = 2\,T(n/2) + n\log n^{-2}$ $T(n) = T\left(\frac{n}{4}\right) + n\log n$ $T(n) = T\left(\frac{n}{2}\right) + 1$ $T(n) = 2T\left(\frac{n}{2}\right) + n\log n$	[5]	CO1, CO2	BL2, BL3
Q.4	Write the Quick Sort algorithm and derive its Time Complexity for Best Case and Worst-Case.	[5]	CO1, CO2, CO3	BL4
Q.5(a)	Explain the Binary Search algorithm and derive its Time Complexity using mathematical induction method.	[2]	CO1, CO2, CO3	BL3
Q.5(b)	Solve the following using Recursion Tree method: $T(n) = 2\,T(n/2) + n$ $T(n) = 3\,T(n/4) + cn^2$	[3]	CO1, CO2, CO3	BL4

::::::22/02/2023::::::M