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

CLASS: IMSC   SEMESTER: V
BRANCH: MATHS & COMP.   SESSION: MO/2022

SUBJECT: CS206 DESIGN AND ANALYSIS OF ALGORITHMS

TIME: 2 HOURS   FULL MARKS: 25

INSTRUCTIONS:
1. The total marks of the questions are 25.
2. Candidates attempt for all 25 marks.
3. Before attempting the question paper, be sure that you have got the correct question paper.
4. The missing data, if any, may be assumed suitably.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

				CO	BL
Q1	(a)	Define time complexity and space complexity.	[2]	1	1
Q1	(b)	Compare the orders of growth of $n!$ and 2^n in terms of asymptotic notations.	[3]	1	2
Q2	(a)	Discuss the relevance of *Average Case Complexity* analysis.	[2]	1	2
Q2	(b)	Solve the recurrence: $T(n) = 3T(n/4) + O(n^2)$ using recursion tree method. The various terms have their usual meanings. The base condition may be assumed suitably.	[3]	1	3
Q3	(a)	Derive best case time complexity of standard quick sort algorithm. Specify the type of instance over which this case is applicable.	[2]	1	2
Q3	(b)	Quicksort is a sorting algorithm whose worst-case running time is $O(n^2)$ on an input array of n numbers. In spite of this slow worst-case running time, quicksort is often the best practical choice for sorting. Justify.	[3]	3	2
Q4	(a)	Specify recurrence relation and hence derive average case time complexity of standard merge sort algorithm,	[2]	1	2
Q4	(b)	Discuss an in-place version of *merge sort* algorithm. Discuss time complexity of your algorithm.	[3]	4, 5	6
Q5	(a)	Design an algorithm to convert a binary number to a decimal integer. Mention the design strategy followed.	[2]	4	6
Q5	(b)	V Pan has discovered a divide-and-conquer matrix multiplication algorithm that is based on multiplying two 70-by-70 matrices using 143,640 multiplications. Find the asymptotic efficiency of Pan's algorithm and compare it with that of Strassen's algorithm.	[3]	5	5

:::::: 01/10/2022 ::::::M