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

CLASS: BE **SEMESTER: III**
BRANCH: CSE **SESSION : MO/2018**

SUBJECT : CS6101 DESIGN AND ANALYSIS OF COMPUTER ALGORITHMS

TIME: 1.5 HOURS **FULL MARKS: 25**

INSTRUCTIONS:
1. The total marks of the questions are 30.
2. Candidates may attempt for all 30 marks.
3. In those cases where the marks obtained exceed 25 marks, the excess will be ignored.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. The missing data, if any, may be assumed suitably.

Q1 (a) There is an integer multiplication method that basically uses "one number divided by 2 and another multiplied by 2". See the following examples to understand the complete method. Then write a recursive algorithm for the method. [both the figures/examples reflect the same method] [2]

85	×	18	=	1530
1		18		18
2		36		
4		72		+ 72
8		144		
16		288		+ 288
32		576		
64		1152		+ 1152
				1530

18	×	85	=	1530
18		85		
9		170		170
4		340		
2		680		
1		1360		+ 1360
				1530

(b) Write a non-recursive algorithm for the question in 1(a). [3]

Q2 (a) Verify whether: $\lg(n!) = \theta(n \lg n)$. [2]
(b) Solve the recurrence using any suitable method (assume a suitable base equation): [3]
$T(n) = 2T(n/2) + n \log n$.

Q3 (a) Establish the recurrence relation of the Strassen's Matrix Multiplication Algorithm. [2]
(b) Prove that the binary search is optimal (compared to any k-ary search where $2<k<=n$, n is the input size). [3]

Q4 (a) Apply 'partition' (specify the name of the partition algorithm applied) on the following set of elements: {5, 2, 6, 7, 8, 1, 4, 9} (explain the steps). [2]
(b) Derive the average case time complexity of the algorithm for finding 'partition' based k-th smallest element. [3]

Q5 (a) Define feasible solution and optimal solution. Use suitable example. [2]
(b) Apply Huffman Coding algorithm on these keys and probabilities: A (0.15), B (0.25), C(0.2), D(0.1), E(0.3). Find the coding for each key and find the compression ratio. [3]

Q6 (a) Explain the role of the disjoint set data structure Kruskal's Algorithm for finding Minimum Spanning Tree. [1]
(b) Write the disjoint set based algorithm for Kruskal's Method.] [4]

:::::: 11/09/2018 ::::::E