

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

**CLASS: ISc  
BRANCH: MATHS & COMP.**

**SEMESTER: IV  
SESSION : SP/2019**

**SUBJECT : CS6101 DESIGN AND ANALYSIS OF COMPUTER ALGORITHM**

**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) What is algorithm? Discuss the different distinct areas of study in algorithm. [2]  
 (b) Explain the following notation. [3]  
 (a) Big -O (b) theta (c) omega
- Q2 (a) Consider the following functions:  $f(n) = 3n^{\sqrt{n}}$ ,  $g(n) = 2^{\sqrt{n} \log n}$ ,  $h(n) = n!$ . which is the following [2]  
 is true show step.  
 (a)  $h(n)$  is  $o(f(n))$  (b)  $h(n)$  is  $o(g(n))$  (c)  $g(n)$  is not  $o(f(n))$  (d)  $f(n)$  is  $o(g(n))$ .  
 (b) Prove that if  $f(n) = a_m n^m + \dots + a_1 n + a_0$ , then  $f(n) = O(n^m)$  [3]
- Q3 (a) Apply master theorem to find the solution of the given recurrence: [2]  
 $T(n) = 7T(n/2) + 18n^2$ ,  $n \geq 2$  and a power of 2.  
 (b) Suggest algorithm binary search using divide and conquer approach. [3]
- Q4 (a) Assume that a merge sort algorithm in the worst case takes 30 seconds for an input of size 64. [2]  
 Find the most closely approximates the maximum input size of a problem that can be solved in 6  
 minutes?  
 (b) Show that average computing time of select (finding kth smallest element) is  $O(n)$ . [3]
- Q5 (a) What is greedy algorithm? [2]  
 (b) Find the optimal solution to the knapsack instance  $n = 3$ ,  $C = 300$ (capacity),  $(p_1, p_2, p_3) = (5, 5, 4)$  and [3]  
 $(w_1, w_2, w_3) = (120, 150, 200)$ .
- Q6 (a) Differentiate between prim's and kruskals's algorithm. [2]  
 (b) Apply kruskal's approach for the following graph and find MST and cost. Show the steps. [3]

