JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

(T-2 Examination April-2018)

B. Tech. 4TH Semester

COURSE CODE: 10B11CI411   MAX. MARKS: 25

COURSE NAME: Fundamental of Algorithms

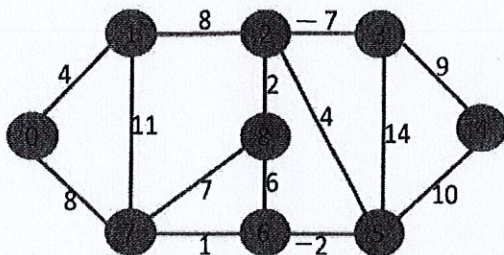COURSE CREDITS: 4   MAX. TIME: 1:30 Hrs

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Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case f unfair means.

Q.1   i.) Describe heap-sort and show that its worst case performance is $O(n \log n)$.   (3+2)
       ii.) Heapify the array {9, 19, 18, 17, 16, 15, 14, 13, 12, 11, 10}. Show the tree structure after each operation.

Q.2
(a)

i.) Find the shortest path with one of the single source shortest path algorithm from source 0 and justify your algorithm you selected for this situation.   3+1

Q.3   i.)   Prove that the Height of the Red-Black tree is $O(\log n)$ separately.   2+1
(a)   ii.)   What is the Node structure required for AVL, Red-Black, and Skip-list?

(b)   i.)   Analyze the worst case time complexity of Bucket sort and Radix sort.   2
       ii.)   Assume that an is given with n elements with a[0] = a[n-1] = -1 and all other elements   +
              of array contain value ≥ 0, now write an algorithm to find any local maxima in   4
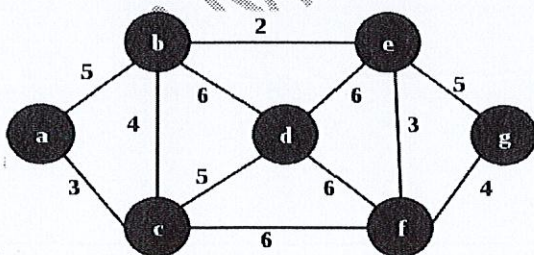 $O(\log(n))$ time.

Q.4
(a)

What is minimum spanning tree and its applications and do followings: 1
+
•   Generate a minimum spanning   3
     tree of the following graph using
     Prim's.

(b)   Generate a Huffman tree of the following Frequency Table and find the average bits   3
       per character:

Character:	A	B	C	D	E	F	G
Frequency:	24	20	16	12	10	9	9