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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

(Make-up Test-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

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

Q.1 i.) Prove that the worst case performance of Heap sort is $O(n^2)$. (3+3)
ii.) Prove that the worst case performance of Merge sort is $O(n \log n)$.

Q.2 Let f(n), g(n), e(n) and d(n) be four positive functions defined as follows:

(a)
i) $d(n) = O(f(n))$
ii) $e(n) = O(g(n))$
iii) $f(n) = O(g(n))$

Justify your answer for the followings either true or false with explanation:
i) $d(n) \neq O(g(n))$ (1)
ii) $ad(n) = O(f(n))$ (1)

Show that: $10\log n + \log \log n$ is $\Omega(\log n)$

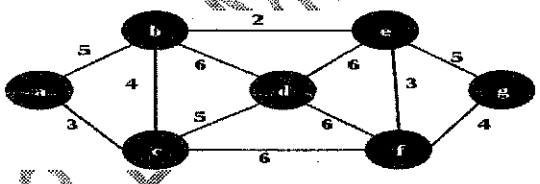
Solve the following recurrences:

(b)
i) $T(n) = 2T(n^{1/2}) + \log n$ 1
ii) $T(n) = 3T(n/2) + n \log n$ using master method. 1
iii) $T(n) = 3T(n/4) + dn^2$ using recursive tree method. 2

Q.3 (a) i.) Prove that the Height of the Red-Black tree is O(log n) separately. 2
ii.) Analyze the worst case time complexity of Bucket sort and Radix sort. 4

Q.4

(a)



What is minimum spanning tree and its applications and do followings: 1 + 3

- Generate a minimum spanning tree of the following graph using Kruskal's.

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

Character:	A	B	C	D	E	F	G
Frequency:	20	18	11	12	15	5	9