算法考试2020年回忆版

一. 选择题（5道，10分）

1.关于排序算法时间复杂度 描述的对错判断

2.快排的时间复杂度是（）

3.不能用贪心解决的问题是（）

A.哈夫曼编码　　B.0-1背包问题

C.活动安排　　D.分数背包问题

4.There’s a B-tree whose minimum degree is t, every node other than the root must have at least __ keys, at most __ keys, every internal node other than the root has at least __ children (　　).

(A) t-1　　2t　　t　　(B) t-1　　2t-1　　t

(C) t　　2t　　t+1　　(D) t-1　　2t+1　　t

5.贪心和动态规划共有的属性是（）

A.最优子结构　　B.贪心选择性

C.重叠子问题　　D.。。。（忘记了）

二. 主方法的实例应用（10分）

T(n)=3T(n/2)+n^2-5n+7,应用主方法分析其时间复杂度。

三. 哈希表：碰撞处理（12分）（平常作业题）

Consider inserting the keys 10, 22, 31, 4, 15, 28, 17, 88, 59 into a hash table of length m=11 using open addressing with the primary hash function $h'(k) = k \bmod m$. Illustrate the result of inserting these keys

using linear probing, using quadratic probing with c_1=1 and c_2=3, and using double hashing with $h_2(k) = 1 + (k \, mod \, (m-1))$.

四．描述活动安排的伪代码，并证明其符合贪心性质。（12 分）

五．平摊分析时间复杂度：（1）聚集法（6 分）；（2）势能法（6 分）

六．红黑树插入操作（三种情形都用到了）（12 分）

七．最长公共子序列拓展（10 分）（平常作业题）

Let X and Y be two strings. We want to convert the string X to the string Y with a minimum of character operation. The character operations mentioned here include: (1) Delete a character; (2) Insert a character; (3) Change one character to another. The minimum number of character operations used to convert the string X to Y is called the edit distance from the string X to Y. Please design an efficient algorithm to calculate the edit distance of any two strings X and Y.

String X: FAMILY	F	-	A	M	I	L	Y
String X: FRAME	F	R	A	M	E		
number of character operation		Inserte R			I→E	Delete L	Delete Y

八．单纯形计算。给出标准型，求最终计算结果。（10 分）

九．NPC 证明（12 分）（平常作业题）

(CLRS 34.5-6) Show that the hamiltonian-path problem is NP-complete.

(You may assume that you know that HAM-CYCLE is NP-complete.)