

本试卷内容由个人回忆，可能有误。实际上的试题是全英文的，部分内容由于具体表达记不清了用中文表述

个人笔记:<https://birchtree2.github.io/categories/%E7%A6%BB%E6%95%A3%E6%95%B0%E5%AD%A6/>

一、判断题($10 \times 2 = 20$ pts)

二、单项选择题($10 \times 2 = 20$ pts)

三、填空题($5 \times 3 = 15$ pts)

1. 把infix notation转成prefix notation
2. 求包含关系 R 的最小等价关系
3. 4×4 有标号的棋盘, 放4个不同物体, 两个物体不能在同一行或同一列, 求方案数
4. 求使得 C_n 与 C_n 的补图同构的 n
5. 求29在模37下的逆元

四、解答题

5.(15pts)

a_n denotes the number of ternary string of length n containing 2 consecutive 0s

(a) find the recursive relation of a_n

(b) solve the recurrence **using characteristic roots**

(c) solve the recurrence **using generating function**

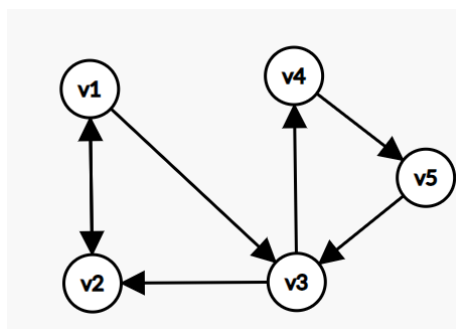
6.(5pts): R is a relation on set A . $S = \{(a, b) | a \in A, b \in A, \exists c (a, c) \in R \wedge (c, b) \in R\}$. Prove that if R is an equivalence relation, then S is also an equivalence relation

7.(10pts): 给出A,B,C,D,E,F,G,H的出现频率

(a) 计算哈夫曼编码

(b) 计算平均编码长度

8.(15pts): a directed graph



(a) Find the number of routes of length 4 in the directed graph

(b) Find whether the directed graph is strongly connected. If not, find all the connected components.

(c) Is the **underlying undirected graph** a Hamilton Graph? Give your reasons.

(d) Use backtrack method to find the chromatic number of the **underlying undirected graph**

(e) Use breadth-first search to find the spanning tree of the **underlying undirected graph** with root v_1

