北京邮电大学 2021—2022 学年第二学期

卷五:Discrete Mathematics–Midterm Test

考试注意事项	一、请将答案放置在试卷对应题目下，可以文本形式作答，也可粘贴图片（图片形式请裁剪得当）。 二、请在 2022 年 5 月 15 日星期日 12:00 前将发往指定邮箱 Bupt_2021@163.com，主题为《期中考试_姓名_学号》，附件为本答卷，文件名改为期中考试_姓名_学号.word。 三、学生作答试卷不得抄袭，如被发现，按相应规定严肃处理。

考试课程	离散数学				考试时间								
题号	一	二	三	四									总分
满分	25	25	25	25									
得分													
阅卷教师													

1. [25 points] Which of these relations on the set of all people are equivalence relations? Determine the properties of an equivalence relation that the others lack.
   a){(a, b) | a and b are the same age}
   b){(a, b) | a and b have the same parents}
   c){(a, b) | a and b share a common parcnt}
   d){(a, b) | a and b have met}
   e){(a, b) | a and b speak a common language}

2. [25 points] Let $\boldsymbol{A}$ be a set with n elements. How many commutative binary operations can be defined on $\boldsymbol{A}$?

3. [25 points] Consider the (3, 5) group encoding functione: $B^3 \rightarrow B^5$ defined by

e(000) = 00000	e(100) = 10011
e(001) = 00110	e(101) = 10101
e(010) = 01001	e(110) = 11010
e(011) = 01111	e(111) = 11100

Decode the following words relative to a maximum likelihood decoding function.

(a) 11001 (b) 01010 (c) 00111

4. [25 points]
   a) Find all solutions of the recurrence relation $a_n = 2a_{n-1} + 2n^2$.
   b) Find the solution of the recurrence relation in part(a) with initial condition $a_1 = 4$.