北京邮电大学 2021—2022 学年第二学期

卷七:Discrete Mathematics—Midterm Test

<table>
<tr><td rowspan="4">考试注意事项</td><td>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)。</td></tr>
<tr><td>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。</td></tr>
<tr><td>三、学生作答试卷不得抄袭,如被发现,按相应规定严肃处理。</td></tr>
</table>

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] Let S be the set of all strings of English letters. Determine whether these relations are reflexive, irreflexive, symmetric, antisymmetric, and/or transitive.

    a) R1 = {(a, b) ∣ a and b have no letters in common}

    b) R2 = {(a, b) ∣ a and b are not the same length}

    c) R3 = {(a, b) ∣ a is longer than b}

2. [25 points] determine whether the set together with the binary operation is a group, If it is a group, determine it is Abelian; specify the identity and the inverse of a generic element.

    a) Q, the set of all rational numbers under the operation of addition.

    b) R, under the operation of multiplication.

c) Z^+, under the operation of addition.

3. [25 points] determine the coset leaders for $N = e_H(B^m)$ for the given parity check matrix H.

$$H = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

4. [25 points] Find all solution of the recurrence relation
$$a_n = 7a_{n-1} - 15a_{n-2} + 12a_{n-3} + n4^n \text{ with } a_0 = -2, a_1 = 0, \text{ and } a_2 = 5.$$