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学号:

班级.

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考	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
试	· 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。

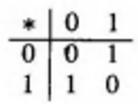
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注意

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考试课程	离散数学			考试时间							
题号	_	1	111	四							总分
满分	25	25	25	25							
得分											
阅卷教师											

- 1. [25 points] For each of these relations on the set {1, 2, 3, 4}, decide whether it is reflexive, whether it is symmetric, whether it is asymmetric, whether it is antisymmetric, and whether it is transitive.
 - a) $\{(2, 2), (2, 3), (2, 4), (3, 2), (3, 3), (3, 4)\}$
 - b) $\{(1, 1), (1, 2), (2, 1), (2, 3), (3, 3), (4, 4)\}$
 - c) $\{(2, 4), (4, 2)\}$
 - d) $\{(1, 2), (2, 3), (3, 4)\}$
 - e) $\{(1, 1), (2, 2), (3, 3), (4, 4)\}$
 - f) $\{(1, 3), (1, 4), (2, 3), (2, 4), (3, 1), (3, 4)\}$

- 2. [25 points] Determine whether the relation R on the semigroup S is a congruence relation.
 - a) S = Z under the operation of ordinary addition; a R b if and only if a+b is even.
 - b) $S = \{0, 1\}$ under the operation * defined by the table



a R b if and only if a*a = b*b. (Hint: Observe that if x is any element in S, then x*x = 0.)

3. [25 points] Show that the (2, 5) encoding function e: $B^2 \rightarrow B^5$ defined by

$$e(00) = 00000$$

$$e(10) = 10101$$

$$e(01) = 01110$$

$$e(11) = 11011$$

is a group code.

4. [25 points] Find the solution of the recurrence relation $a_n = 2a_{n-1} + 3 \cdot 2^n$.