

國立高雄第一科技大學 97 學年度 碩士班 招生考試 試題紙

系 所 別：電腦與通訊工程系

組 別：電腦組

考科代碼：2121

考 科：離散數學

注意事項：

- 1、本科目可使用本校提供之電子計算器。
- 2、請於答案卷上規定之範圍作答，違者該題不予計分。

1. (a) How many of the five-digit integers have five different digits that are increasing, as in 13457, 35679, and 45689? (5%)  
(b) How many of the five-digit integers have five different digits that are decreasing, as in 65421, 76431, and 98532? (5%)  
(c) How many of the five-digit integers have five digits that are non-decreasing, as in 13479, 24468, and 33359? (5%)  
(d) How many of the five-digit integers have five digits that are non-increasing, as in 64321, 66533, and 99880? (5%)

2. True and False.

(每小題 3 分，共 18 分)

For a prescribed universe of discourse and any open statements  $G(x)$  and  $H(x)$  in the variable  $x$ ,

- (a)  $[\exists x G(x) \wedge \exists x H(x)]$  is logically equivalent to  $\exists x [G(x) \wedge H(x)]$ .
- (b)  $[\forall x G(x) \wedge \forall x H(x)]$  is logically equivalent to  $\forall x [G(x) \wedge H(x)]$ .
- (c)  $[\exists x G(x) \vee \exists x H(x)]$  is logically equivalent to  $\exists x [G(x) \vee H(x)]$ .
- (d)  $[\forall x G(x) \vee \forall x H(x)]$  is logically equivalent to  $\forall x [G(x) \vee H(x)]$ .
- (e)  $[\exists x G(x) \rightarrow \exists x H(x)]$  is logically equivalent to  $\exists x [G(x) \rightarrow H(x)]$ .
- (f)  $[\forall x G(x) \rightarrow \forall x H(x)]$  is logically equivalent to  $\forall x [G(x) \rightarrow H(x)]$ .

3. Find the simultaneous solution for the system of three congruences:

- (a)  $x \equiv 2 \pmod{3}$ ,  $x \equiv 3 \pmod{5}$ , and  $x \equiv 4 \pmod{7}$ . (6%)
- (b)  $x \equiv 1 \pmod{3}$ ,  $x \equiv 13 \pmod{16}$ , and  $x \equiv 73 \pmod{81}$ . (6%)

4. Professor Chen gave his Digital Design class a test consisting of three questions. There are fifty students in his class. Three students did not answer any question. Ten students did not answer the first question, fourteen failed to answer the second question, and twelve did not answer the third question. If eighteen students answered all three questions.
- (a) How many answered exactly one question? (5%)
  - (b) How many answered exactly two questions? (5%)
5. Let the set  $A=\{1, 2, 3, 4, 5, 6\}$ ,  $B=A \times A$ , and define the relation  $R$  on  $B$  as follows:  $(a,b)R(x,y)$  if and only if  $(a-b)=(x-y)$ .
- (a) Find the equivalence class  $[(3,2)]$ . (5%)
  - (b) Compute the partition of  $B$ ,  $B/R$ . (5%)
6. The connected undirected graph  $G=(V, E)$  has 120 edges.
- (a) What is the maximum value that  $|V|$  can have? (4%)
  - (b) What is the minimum value that  $|V|$  can have? (4%)
  - (c) What is the minimum value that the height of  $G$  can have, if  $G$  is a ternary tree? (4%)
7. Let
- $$H = \begin{bmatrix} 0 & 0 & 0 & 1 & 1 & 1 & 1 \\ 0 & 1 & 1 & 0 & 0 & 1 & 1 \\ 1 & 0 & 1 & 0 & 1 & 0 & 1 \end{bmatrix}$$
- be the parity-check matrix for a Hamming (7,4) code.
- (a) Encode the following messages: 1010 and 1101. (4%)
  - (b) Decode the following received words: 1001010 and 1010001. (6%)
  - (c) Construct a decoding table consisting of the syndromes and coset leaders for this code. (8%)