

國立嘉義大學 107 學年度

資訊工程學系碩士班招生考試試題

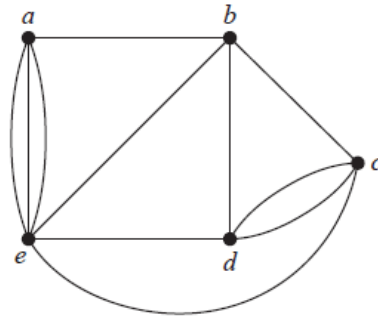
科目：離散數學

1. Please determine whether each of the following functions from Z to Z is invertible (one-to-one and onto) function or not? (Note: Z means the set that contains all of the integers) (20%)

(a) $f(x) = (x+1) \times (x-1) \times x$

(b) $f(x) = x - \left\lfloor \frac{x}{2} \right\rfloor$

2. Find an Eulerian circuit in the following graph if it exists. If it does not exist, please explain the reason. (10%)



3. Determine the number of possible integer solutions for $x_1 + x_2 + x_3 + x_4 = 32$, where

(a) $x_i \geq 0, 1 \leq i \leq 4$

(b) $x_i > 0, 1 \leq i \leq 4$

(c) $x_i \geq 8, 1 \leq i \leq 4$

(d) $x_1, x_2, x_3 \geq 0, 0 \leq x_4 \leq 25$

(20%)

4. Show that (10%)

$$(A \cap B) \cup \overline{(B \cap C)} \supseteq (A \cup \overline{B}).$$

5. Arranging all of the letters in MASSASAUGA. How many is the possible arrangements? If all four A's are together? (10%)

6. Determine the number of nonnegative integer solutions to the equation. (10%)

$$x_1 + x_2 + x_3 + x_4 = 18 \text{ and } x_i \leq 7 \text{ for all } i.$$

7. Suppose that $S = \{0, 1, 2, 3\}$. Let R be a relation containing (a, b) if $a \leq b$, where $a \in S$ and $b \in S$. Is R reflexive, symmetric and antisymmetric? (10%)

8. Use logically equivalent statements without the direct use of truth tables, show that

(1) $p \leftrightarrow \neg(p \wedge s) \rightarrow (\neg s \wedge p)$.

(2) $\neg(p \leftrightarrow q) \leftrightarrow (p \wedge \neg q) \vee (q \wedge \neg p)$.

(10%)