國立嘉義大學 111 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. Simplify the expression $\overline{\overline{(A \cup B) \cap C} \cup \overline{B}}$. (10%)

2. Determine the number of nonnegative integer solutions to the equation $x_1 + x_2 + x_3 + x_4 = 18$ and $x_i \leq 7$ all i. (20%)

3. In how many ways can a police captain distribute 24 rifle shells to four police officers so that each officer gets at least three shells, but not more than eight? (20%)

4. Determine the following sets:
   (a) $P(\{a, b\})$, where $P(A)$ represents the power of set of Set A. (5%)
   (b) $\{\{\emptyset\}\} \oplus \{a, \emptyset, \{\emptyset\}\}$. (5%)
   (c) $\{a, \emptyset, \{\emptyset\}\} - \{\emptyset\}$. (5%)
   (d) $\{\emptyset\} \cap P(\{\emptyset\})$. (5%)

5. Determine whether the following functions from *Z* to *Z* are invertible (one-to-one and onto) functions or not?
   (a) $f(x) = 10 - x$. (5%)
   (b) $f(x) = \lceil x/2 \rceil$. (5%)
   (c) $f(x) = x - \left\lfloor \frac{x}{2} \right\rfloor$. (5%)
   (d) $f(x) = x^2 + 5$. (5%)

6. Given two propositions *p* and *q*, please show that $\overline{p \vee q} \leftrightarrow \overline{p} \wedge \overline{q}$ is a tautology. (10%)