Math132 L1 Discrete Structure: Midterm Exam

Dept of Math, HKUST, Fall 1999

Name:____________________ Class Section:____________________

ID No.____________________ Tutorial Section:____________________

Problem	No.1(12)	No.2(12)	No.3(12)	No.4(10)	No.5(10)	No.6(12)	No.7(12)	Total(80)
Score								

1. Let A and B be sets. Please circle "Yes" or "No" for the following statements: (12 pts, each 2 pts)

   (a) $\overline{A} \cup B = \overline{A \cap \overline{B}}$ Yes or No

   (b) $A \cup \overline{B} = \overline{A} \cap B$ Yes or No

   (c) $(\overline{A} \cap B) \cup (A \cap \overline{B}) = A \cup B - A \cap B$ Yes or No

   (d) Countable sets are infinite Yes or No

   (e) $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$ Yes or No

   (f) Infinite sets are uncountable. Yes or No

2. Let p, q and r be statements. Please circle "Yes" or "No" for the following statements: (12 pts, each 2 pts)

   (a) $(p \to q) \wedge (q \to r) \to (p \to r)$ is a tautology. Yes or No

   (b) $(p \to q) \leftrightarrow (\neg q \to \neg p)$ is a tautology. Yes or No

   (c) $p \wedge (p \to q) \to q$ is a tautology. Yes or No

   (d) $(\forall x\ P(x) \vee Q(x)) \to (\forall x\ P(x)) \vee (\forall x\ Q(x))$ Yes or No

   (e) $(\exists x\ P(x) \wedge Q(x)) \leftrightarrow (\exists x\ P(x)) \wedge (\exists x\ Q(x))$ is a tautology. Yes or No

   (f) $(\forall k\ P(k)) \to (\forall k\ P(k) \to P(k+1))$ is a tautology. Yes or No

3. Find all integer solutions for the following equation

$$98x - 68y = 38$$

   (12 pts)

4. Show that among any 52 integers there are at least two numbers whose sum or difference is a multiple of 100. (10 pts)

5. Vivian will buy 10 pencils from a store where 4 types of pencils are provided. How many possible ways for Vivian to select 10 pencils from the store? (10 pts)

6. Find the number of increasing coordinate paths from the origin $(0,0,0)$ to the point $(5,6,7)$. (Hint: Don't use try-error method) (12 pts)

7. 12 different size color marbles are used to make a necklace; there are 3 different colors and each color has 4 marbles. How many patterns can be made so that the marbles of the same color are not all together. (12 pts)