國　立　宜　蘭　大　學

１０２學年度研究所碩士班考試入學

離散數學試題

（電子工程學系碩士班）

准考證號碼：

《作答注意事項》

1. 請先檢查准考證號碼、座位號碼及答案卷號碼是否相符。
2. 考試時間：100 分鐘。
3. 本試卷共有 10 題 計算題，共計 100 分。
4. 請將答案寫在答案卷上。
5. 考試中禁止使用大哥大或其他通信設備。
6. 考試後，請將試題卷及答案卷一併繳交。
7. 應試時不得使用電子計算機。

1. (5%) Please calculate the value of 3^{100} mod 4.
2. (5%) Please draw a graph of $K_{4,4}$.
3. (10%) Please verify that $\sum_{k=0}^{n-1} C(n,k)2^k = 3^n - 2^n$, in which $C(n,k)$ is the coefficient of the x^k term in the expansion of $(1+x)^n$.
4. (10%) Please demonstrate the order for the sum of the first n integers.
5. (10%) Supposing S={1, 2,…., n}, please verify that if n is even, any $n/2+1$ subset of S includes two numbers whose sum is $n+1$.
6. (10%) Please try your best to describe Euler's formula for planar graphs.
7. (10%) Supposing $n \in Z^+$, please verify $(\cos\theta)(\cos 2\theta)(\cos 4\theta)(\cos 8\theta)...(\cos(2^{n-1}\theta)) = \frac{\sin(2^n\theta)}{2^n \sin\theta}$.
8. (10%) Supposing n is an nonnegative integer, please prove that $\sum_{k=0}^{n} 3^k \binom{n}{k} = 4^n$.
9. (15%) Please demonstrate the calculation of probability $P((A-C)\,|\,B)$ by using Venn diagram of sets A, B and C where $B \cap C = \{\}$.
10. (15%) Please find the solution of the following recurrence relation and also the value of a_{16}, where $a_{n+1}^2 = 5a_n^2, a_n \geq 0, a_0 = 3$.