

中原大學 104 學年度碩士班考試入學

104/3/4 10:10 AM~11:40 AM

誠實是我們珍視的美德，
我們喜愛「拒絕作弊，堅守正直」的你！

應用數學系資訊科學組

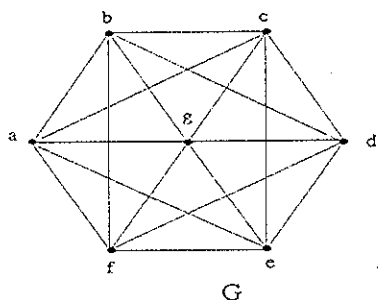
科目：離散數學

(共 1 頁，第 1 頁)

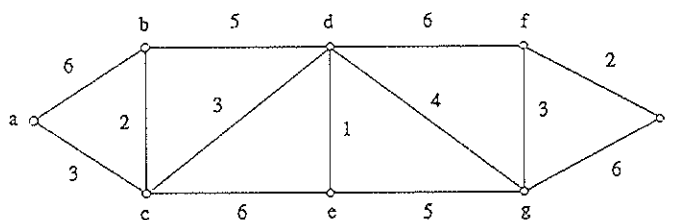
可使用計算機(僅限於四則運算、三角函數及對數等基本功能，可程式之功能不可使用)

不可使用計算機

1. Show that if f and g are real-valued functions such that $f(x)$ is $O(g(x))$, then $f^2(x)$ is $O(g^2(x))$. [Note that $f^2(x) = [f(x)]^2$]. (10%)
2. Show that an undirected graph has an even number of vertices of odd degree. (10%)
3. Devise a recursive algorithm to find the n th term of the sequence defined by $a_0 = 1$, $a_1 = 1$, and $a_n = a_{n-1} + 2a_{n-2}$, for $n = 2, 3, 4, \dots$. (10%)
4. Use Kuratowski's Theorem to show that the graph G is nonplanar. (10%)



5. Find a shortest path between a and z in the following weighted graphs. (15%)



6. Find the number of integer solutions to the equation $x_1 + x_2 + 3x_3 = 24$, where $x_1 \geq 1, x_2 \geq 0$ and $x_3 \geq 2$. (15%)
7. Find a general solution to $a_n - 7a_{n-1} + 10a_{n-2} = 3$. (15%)
8. Find all solutions to the system of congruences. (15%)
 $x \equiv 2 \pmod{3}$
 $x \equiv 1 \pmod{7}$
 $x \equiv 3 \pmod{13}$