

# 中原大學 97 學年度碩士班入學考試

4 月 13 日 16:00~17:30 應用數學系資訊科學組

誠實是我們珍視的美德，  
我們喜愛「拒絕作弊，堅守正直」的你！

科目：離散數學

(共 1 頁第 1 頁)

可使用計算機，惟僅限不具可程式及多重記憶者

不可使用計算機

1. Devise an algorithm that finds the sum of all the integers in a list. (10%)
2. Sort the list 15, 6, 9, 5, 20, 3, 12, 8, 1, 17, 4, 21, 7, 18 using a merge sort. (15%)
3. Show that  $P(n, k)$ , the number of  $r$ -permutations of  $n$  distinct objects, is  $O(n^k)$ . (10%)
4. Devise a recursive binary search algorithm. (10%)
5. How many regions would there be in a connected planar simple graph with 10 vertices each of degree 3? (10%)
6. Show that a full  $m$ -ary tree with  $i$  internal vertices contains  $n = mi + 1$  vertices. (10%)
7. Use Huffman coding to encode the following symbols with frequencies listed: A:0.21, B:0.08, C:0.31, D:0.15, E:0.05, F:0.07, G:0.13. What is the average number of bits used to encode a character. (15%)
8. What is the value of the postfix expression  $8\ 4\ /\ 2\ 3\ *\ +\ 9\ 2\ 1\ +\ /\ *$ . (10%)
9. Find the number of integer solutions to the equation

$$x_1 + x_2 + x_3 = 20$$

Where  $2 \leq x_1, 1 \leq x_2, 3 \leq x_3$  (10 points)