

八十五學年度國立台灣工業技術學院研究所碩士班招生考試

所別：電子工程技術研究所

組別：計算機組

科目：離散數學與資料結構

1. State and **prove** the principle of mathematical induction. (10%)

2. The Sheffer stroke is the connective ' $|$ ' defined by the truth table:

p	q	$p q$
0	0	1
0	1	1
1	0	1
1	1	0

$p, q$  are propositions

(a) Check the associative and commutative laws under Sheffer stroke. (5%)

(b) Find a proposition equivalent to  $p \rightarrow q$  using only the Sheffer stroke. (5%)

3. Give an explicit formula for sequence  $\{s_n\}$ , where  $s_0=2, s_1=-1$ , and

$$s_n = -s_{n-1} + 6s_{n-2}, \text{ for } n \geq 2. \quad (10\%)$$

4.(a) Find the probability (give reason for every formula you use) of what a number is selected at random from 1000 to 9999, and the sum of the digits of the number is exactly 9. (8%)

(b) Do the same as (a), if the number has no zero digit. (7%)

5. How to test a relation  $R$  is transitive? Give the answer and **prove** it. (10%)

6.(a) Give and describe the data structures that you need in converting infix expressions to postfix. (5%)

(b) Give the postfix expression converted from  $A+B*(C-D)/(P-R)$ . (5%)

7.(a) Give and describe two representation methods of implementing of a binary tree. (5%).

(b) Compare and discuss the methods in (a) (5%)

8. Give the definition of the minimum cost spanning tree of a connected graph and **write** an algorithm for finding the minimum cost spanning tree of a connected graph. (10%)

9. Give an algorithm to determine the cost of the shortest paths from one vertex  $v_0$  to all other vertices (not all pairs) in  $G=(V,E)$ , where  $V=\{v_0, v_1, \dots, v_n\}$  is the set of vertices and  $E$  is the set of edges. (15%)

