

國立嘉義大學 113 學年度
資訊工程學系碩士班招生考試試題

科目：離散數學（共 100 分）

1. Suppose $P(x, y)$ is some binary predicate defined on a very small domain of discourse: just the integers 1, 2, 3, and 4. For each of the 16 pairs of these numbers, $P(x, y)$ is either true (T) or false (F), according to the following table (x values are rows, y values are columns).

	1	2	3	4
1	T	F	F	F
2	F	T	T	F
3	T	T	T	T
4	F	F	F	F

For example, $P(1, 3)$ is false, as indicated by the F in the first row, third column. Use the table to decide whether the following statements are true, false or not enough information. Please give the related description about the reasons of your answers. (20%)

- (a) $\forall x \exists y P(x, y)$
- (b) $\forall y \exists x P(x, y)$
- (c) $\exists x \forall y P(x, y)$
- (d) $\exists y \forall x P(x, y)$

2. Given $a_0 = 0$, $a_1 = 1$, and

$$3a_n - 10a_{n-1} + 3a_{n-2} = 3^n \text{ for } n \geq 2;$$

Solve the equation. (20%)

3. According to the values of a and b given in the following, find by the division algorithm, the values of q and r such that,

$$a = qb + r, \text{ where } 0 \leq r < |b|$$

- (a) $a = 387$; $b = 28$; (5%)
- (b) $a = -78$; $b = 15$; (5%)

4. The pre-order traversal sequence of a binary search tree is
31, 21, 11, 16, 26, 24, 40, 36, 43.

(a) What is the in-order traversal?(10%)

(b) What is the post-order traversal?(10%)

5. About the probability

(a) What is the probability that a positive integer selected at random from the set of positive integers not exceeding 100 is divisible by either 3 or 5? (10 %)

(b) What is the probability that a positive integer selected at random from the set of positive integers not exceeding 1000 is NOT divisible by either 7 or 9? (10 %)

6. A cookie shop has 7 different kinds of cookies. How many different ways can 10 cookies be chosen? Assume that only the type of cookie, and not the individual cookies or the order in which they are chosen, matters. (10 %)