國立中與大學

108 學年度 碩士班考試入學招生

試

題

學系:資訊科學與工程學系 甲組

科目名稱:基礎數學A

10B 84

科目:基礎數學A 系所:資訊科學與工程學系甲組

3B

本科目不得使用計算機

本科目試題共二頁 第一頁

Part I Discrete Mathematics

A. Fill the blanks from ① to ⑨. (4 points each)

1. Assume that an automatic recognizer is used to distinguish boys from a group of people which consists of 10 boys and 8 girls. There are 12 persons recognized as boys by the recognizer. However, only 9 out of these 12 persons are actually boys, other 3 persons are girls. With these statistics, the precision and accuracy of this recognizer are 1 and 2 respectively.

2. In the equation of $y_1 + y_2 + 5y_3 = 12$, there are 7 solutions of positive integers (that is, y_1 , y_2 , and y_3 are all positives) and ③ non-negative integers. 24

3. Translate the following 2 statements using logical symbols, such as ∀ and ⅓ ∀x∃y.x≤y propositional variables, and logical operators. The logical expression for "There is no maximum integer" is ④ and the logical expression of "Every integer has a unique additive inverse" is ⑤ ∀x∃y[x+y→0,√2(z+y→x+z+0)]

4. The recurrence relation of the number of moves required for Hanoi tower is $a_k = 6$, where $a_1 = 1$, $a_2 = 3$.

5. Assume that there are 1 red ball and 2 blue balls in box 1, and 2 red balls and 3 blue balls in box 2. You choose one ball randomly. If you have selected a red ball, then the probability that you selected a ball from the 1st box is 7.

6. The number of bit strings of length 10 having more 0s than 1s is (8), and the number of bit strings of length 10 having at least 3 1s is (9).

B. True or false (2 pts each for a correct answer and -1 point for a wrong answer)

1. Incidence matrix, for graph representation, is a symmetric matrix.

T2. The <u>cardinality</u> of Q is the same as the cardinality of Z. The cardinality of Z.

√3. Among 100 people there are at least 9 who were born in the same month.

 $\sqrt{4}$. (P(S), ⊆) is a partially ordered set, where P(S) is a power set of S={1,2,4}.

-5. " $\neg p \rightarrow q$ " is logically equivalent to " $\neg (q \leftrightarrow p)$ ", where \neg stands for "not"

6. There are 81 ways to put 4 distinguishable balls into 3 different boxes.

7. Traveling salesman problem is the problem to find an Euler circuit of least cost.

(+MW)/FIN

J446

or 20/1-1t

P-P 9 -1->9 9 P

d $B' = \{\mathbf{v}_1, \mathbf{v}_2, \mathbf{v}_3\}, \text{ wh}$ b) $\begin{bmatrix} 0 & 0 \\ -y_2 & 1 \\ \frac{q}{2} & \frac{q}{2} \end{bmatrix}$

ج لِمُلَّمُ الْمُلْعِينَ

本科目不得使用計算機

本科目試題共二頁 第二頁

Part II Linear Algebra

1. Determine whether the set S is linear independent or dependent. (3% each)

(1) atha

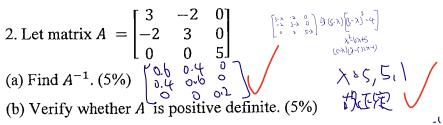
(a)
$$S = \{(2, -1, 4), (3, 6, 2), (2, 10, -4)\}$$
 in \mathbb{R}^3 . Independent

(b)
$$S = \{(2,1,1), (2,-1,3), (2,3,-1)\}$$
 in \mathbb{R}^3 dependent

$$S = \{0, x, x^2\}$$
 in polynomial space P_2 . In lependent X , A

(d)
$$S = \{3 + x + x^2, 2 - x + 5x^2, 4 - x^2\}$$
 in polynomial space P_2 . In Jeph length

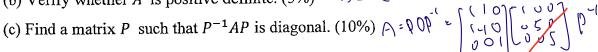
(b)
$$S = \{(2,1,1), (2,-1,3), (2,3,-1)\}$$
 in R^3 dependent X (c) $S = \{(2,1,1), (2,-1,3), (2,3,-1)\}$ in polynomial space P_2 . In Jephnold X (d) $S = \{(3+x+x^2, 2-x+5x^2, 4-x^2)\}$ in polynomial space P_2 . In Jephnold X (e) $S = \{(1+x)^2, x^2 + 2x, 3\}$ in polynomial space P_2 . In Jephnold X (e) $X = \{(1+x)^2, x^2 + 2x, 3\}$ in polynomial space P_3 .

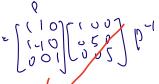




(a) Find
$$A^{-1}$$
. (5%) $\int_{0.4}^{0.5}$







3. Let $T: \mathbb{R}^2 \to \mathbb{R}^3$ be defined by

$$T\left(\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}\right) = \begin{bmatrix} x_1 + 2x_2 \\ -x_1 \\ 0 \end{bmatrix}$$

(a) Find the matrix of T with respect to the bases $B = \{\mathbf{u}_1, \mathbf{u}_2\}$ and $B' = \{\mathbf{v}_1, \mathbf{v}_2, \mathbf{v}_3\}$, where

$$\mathbf{u}_1 = \begin{bmatrix} 1 \\ 3 \end{bmatrix} \quad \mathbf{u}_2 = \begin{bmatrix} -2 \\ 4 \end{bmatrix} \quad \mathbf{v}_1 = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} \quad \mathbf{v}_2 = \begin{bmatrix} 2 \\ 2 \\ 0 \end{bmatrix} \quad \mathbf{v}_3 = \begin{bmatrix} 3 \\ 0 \\ 0 \end{bmatrix}. (10\%)$$

$$\mathbf{v}_1 = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$$

$$\mathbf{v}_2 = \begin{bmatrix} 2\\2\\0 \end{bmatrix} \quad \mathbf{v}_3 = \begin{bmatrix} 2\\1\\0 \end{bmatrix}$$

(b) Use the matrix obtained in (a) to compute $T \begin{bmatrix} 4 \\ 6 \end{bmatrix}$. (5%)

T[6]= 1 1/6