

亞洲大學

96 學年度碩士班入學招生考試試題紙

學系別	考試科目	考試日期	時 間
資訊學院	數學(A)	96.4.21	13:30-15:10

1. Let $A = \begin{bmatrix} 1 & 2 \\ 3 & 0 \end{bmatrix}$, (1) Find all the eigenvalues of A (5%) (2) Find all the eigenvectors of A associated with each eigenvalues of A (5%) (3) Compute A^{100} . (10%)

2. Use Cramer's rule to solve
$$\begin{cases} x_1 + 2x_2 + x_3 = 5 \\ 2x_1 + 2x_2 + x_3 = 6 \\ x_1 + 2x_2 + 3x_3 = 9 \end{cases} \quad (10\%)$$

3. Show that the vectors $1, x, x^2, x^3$ are linearly independent in \mathbf{P}_4 (\mathbf{P}_4 denotes the set of all polynomials of degree less than four). (10%)

4. Let $A = \begin{bmatrix} 2 & 1 & 2 \\ 3 & 2 & 2 \\ 1 & 2 & 3 \end{bmatrix}$, compute the adjoint of A and A^{-1} . (10%)

5. Solve the recurrence relation: $a_n = 8a_{n-1} + 10^{n-1}$, $a_1 = 9$. (15%)

6. For $R = \{s, t, x, y\}$, define “+” and “·” operations, making R into a ring by the following tables.

+	s	t	x	y
s	s	t	x	y
t	t	s	y	x
x	x	y	s	t
y	y	x	t	s

·	s	t	x	y
s	s	s	s	s
t	s	t	?	?
x	s	t	?	y
y	s	?	s	?

- (a) Using the associative and distributive laws, determine the entries for the missing spaces in the “·” table. (10%)

- (b) Is the ring commutative? (5%)

7. Use Fermat's Little Theorem to compute $3^{302} \pmod{11}$. (5%)

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/* Note $a^{p-1} \equiv 1 \pmod{p}$, if p is prime and a is an integer not divisible by p */

8. What is the coefficient of the term x^{23} in $(1+x^5+x^9)^{100}$? (5%)
9. In how many ways can the letters $\alpha, \alpha, \alpha, \alpha, \beta, \beta, \beta, \gamma, \gamma$ be arranged so that all the letters of the same kind are not in a single block? (10%)

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