

臺中健康暨管理學院

九十二學年度碩士班暨碩士在職專班招生考試試題紙

系 所 別	組 別	考試科目	考試日期	時 間	備 註
生物資訊學系碩士班					
生物資訊學系碩士在職專班	--	離散數學	92.3.30	13:30-15:10	共一頁

1. If $A = \{1, 2, 3, 4, 5\}$, give an example of a relation R on A that

(a) is neither reflexive nor irreflexive (5%)

(b) is reflexive and transitive, but not symmetric (5%)

2. Let $A = \{1, 2, 3, 4, 5\}$. Let $f: A \rightarrow A$ be defined by

$$f = \{(1,2), (2,2), (3,1), (4,3), (5,3)\}, \text{ so } f^2 = f \circ f = ? \quad (10\%)$$

3. State the generalized De Morgan laws for logic. (5%)

4. Solve the equation $24x \equiv 6 \pmod{81}$. (10%)

5. Order the following integers from least to greatest: (10%)

$$2^{100}, 100^2, 100^{100}, 10^{10}, 100! \quad (\text{A formal proof is necessary})$$

6. Use mathematical induction to prove that $\binom{2n}{n} \leq 4^n$, for all $n \in \mathbb{N}$. (10%)

7. Solve the recurrence relation (10%)

$$a_n = 6a_{n-1} - 12a_{n-2} + 8a_{n-3} + 2^n, \text{ for } n \geq 3.$$

8. The following is a program segment: (5%)

for i:= 1 to 15 do

for j:= 1 to i do

for k:=1 to j do

print i, j, k

How many times is the print statement executed in the program segment?

9. Find the multiplicative inverse of each element in \mathbb{Z}_5 . (10%)

10. Given an example of a connected graph that has (10%)

(a) an Euler cycle but contains no Hamiltonian cycle;

(b) a Hamiltonian cycle but not an Euler cycle.

11. Let A be the adjacency matrix of the graph K_5 . Find a formula for the

entries in A^j , where $j \in \mathbb{N}$. (10%)