## 國立臺北科技大學

## 九十八學年第一學期電機系博士班資格考試

## 模糊控制試題

第一頁 共二頁



- 注意事項:
  1. 本試題共【4】題,配分共100分。
  2. 請按順序標明題號作答,不必抄題。
  3. 全部答案均須答在試卷答案欄內,否則不予計分。
   小時。
- 1. Given a universe of discourse  $U = [0, \infty)$ , and two fuzzy sets  $A \subset U$  and  $B \subset U$ . If the membership functions of A and B are respectively defined as following:

$$\mu_A(x) = \frac{1}{1 + (x - 5)^2}, \quad \mu_B(x) = \begin{cases} (x - 2)/4, & 2 \le x \le 6 \\ (10 - x)/5, & 6 < x \le 10 \end{cases},$$

find the  $\alpha$ -cuts of A and B for  $\alpha = 0.5$  and 0.7 with the resolution 0.2. (20%)

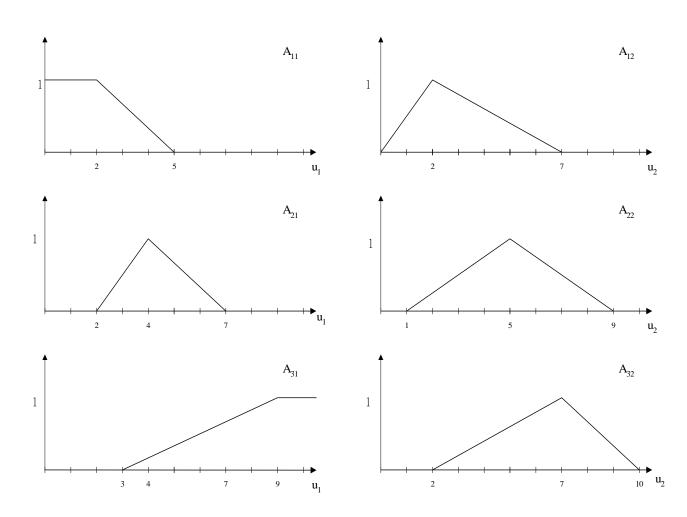
- (a) Given a function  $T(a,b) = \frac{ab}{max\{a,b,0.5\}}$ , show that the function  $T(\cdot)$  is an operation of s norm.
  - (b) Design a function by yourself and show that this function is an s norm. (do not use  $max(\cdot)$  as your designed function) (20%)
- 3. Given a set of input/output data as following table where two inputs are denoted as x1 and x2 and output is denoted as y, please design a fuzzy rule base using Table Look-Up scheme. Show your design ideas in detail. (30%)

t	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
x1	1	1.9	2.9	3.8	4.6	5.5	6.2	7.5	8.0	8.7	9	9.3	9.5	9.6	9.7	9.8	9.9	9.9
x2	0	9.4	18.2	26.6	34.4	41.8	48.6	54.9	60.7	66	70.8	75	78.7	81.9	84.5	86.7	88.3	89.4
у	-19	-18	-17	-15.9	-14.8	-13.8	-12.7	-11.7	-10.6	-9.6	-8.5	7.5	-6.4	-5.3	-4.3	-3.2	-2.2	0

4. Given a fuzzy system with fuzzy rule base as following, please write a computer program to calculate the output of the fuzzy system. Note that you can use any computer language except Matlab. Please provide necessary details in your answer. The answer containing only computer program without any explanation is NOT accepted. (30%)

if 
$$u_1$$
 is  $A_{11}$  and  $u_2$  is  $A_{12}$  then  $y=7+3u_1-5u_2$   
if  $u_1$  is  $A_{21}$  and  $u_2$  is  $A_{22}$  then  $y=-3+2.5u_1+u_2$   
if  $u_1$  is  $A_{31}$  and  $u_2$  is  $A_{32}$  then  $y=2+5u_1-4u_2$ 

where  $A_{11}$ ,  $A_{12}$ ,  $A_{21}$ ,  $A_{22}$ ,  $A_{31}$  and  $A_{32}$  are described as followings. Note that the "and" operation in fuzzy rule is assumed to be "min" operation.



第二頁 共二頁