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

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。
4. 考試時間:二小時。

1. Given a universe of discourse U = [0, ∞), and two fuzzy sets A ⊂ U and B ⊂ U. If the membership functions of A and B are respectively defined as following:

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

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

2. (a)Given a function $T(a,b)=\frac{ab}{max\{a,b,0.5\}}$, show that the function T(·) 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(·) 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
y	-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.