國 立 臺 北 科 技 大 學

九十七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【5】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) (a) Please give an illustration for fuzzy set and define its fuzzy membership function? Explain them in detail too. (If you just plot without any explanation for the fuzzy set meaning, there will be no points) (10%)

(b)Plot fuzzy sets intersection and explain what the practical meaning of it is. (If you just plot it without any explanation, there will be no points) (10%)

(c) Please use an example to explain what is the fuzzy relation? (10%)

(2) By Extension Principle, please plot f(A)(y), where $f(x)=y=\begin{cases}2, & x\le 2\\ 3x, & \text{others}\end{cases}$ and the fuzzy set A is shown in Figure 1. (10%)

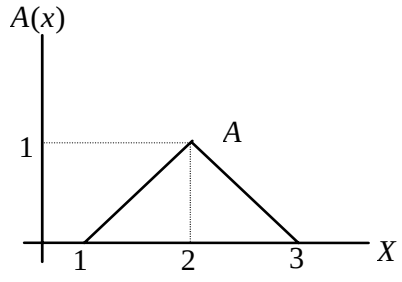

Figure 1

(3) In GMP (Generalized Modus Ponens), there is $B'(y)=\max\{\min[A'(x), (A\to B)(x,y)]\}$. By using Dienes-Rescher Implication: Fp1→Fp2 ⇔ max[1-Fp1(x), Fp2(y)], now, we have $A=0.6/x1+1/x2+0.7/x3$, $B=0.4/y1+0.9/y2$, and $A'=0.5/x1+0.9/x2+0.5/x3$. What is

the conclusion "y is B' "? That is B'=? (20%)

(4) Please find W= $P^{-1} \circ Q^{-1}$, where $\circ$ is the Max-min operation. (10%).

$$P = \begin{bmatrix} 1 & 0.7 & 0.5 \\ 0.7 & 1 & 0.5 \\ 0.5 & 0.5 & 1 \end{bmatrix}, \qquad Q = \begin{bmatrix} 0.2 & 0.7 & 0.4 \\ 0.1 & 0.5 & 0 \\ 0 & 0.6 & 0.1 \end{bmatrix}$$

(5) We have to control an inverted pole, the fuzzy variables (θ ,$\dot{\theta}$, u) and the control rule table are shown in the following Figure 2 and Table 1, respectively. Please use Minimum Inference Engine and Center of Gravity Defuzzification to find the control output U, while the singleton input is (θ =12, $\dot{\theta}$ =-15). (30%)

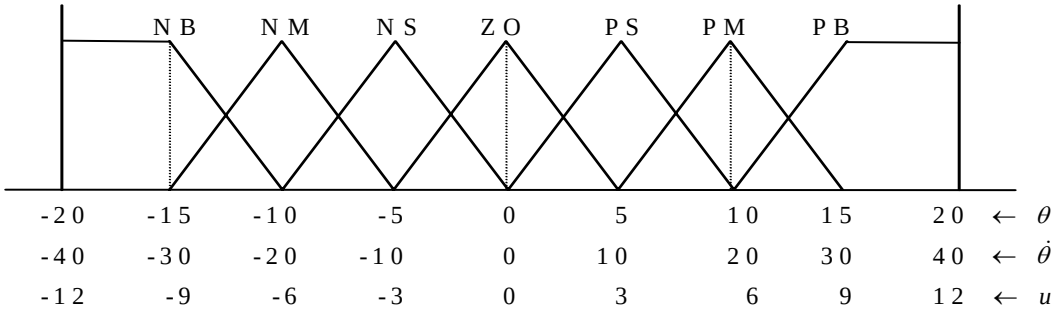

Figure 2

θ \ $\dot{\theta}$	**N B**	**N M**	**N S**	**Z O**	**P S**	**P M**	**P B**
N B	N B	N B	N B	N B	N M	N M	N S
N M	N B	N B	N M	N M	N S	Z O	Z O
N S	N B	N M	N S	N S	Z O	P S	P M
Z O	N B	N M	N S	Z O	P S	P M	P B
P S	N M	N S	Z O	P S	P S	P M	P B
P M	Z O	Z O	P S	P M	P M	P B	P B
P B	P S	P M	P M	P B	P B	P B	P B

Table 1