B.E. (Electrical Engineering (Electronics & Power)) Semester Seventh (C.B.S.)
Elective - I : Fuzzy Logic and Neural Networks

P. Pages : 3

Time : Three Hours

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0829

Max. Marks : 80

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Notes : 1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data wherever necessary.
10. Illustrate your answers wherever necessary with the help of neat sketches.
11. Use of non programmable calculator is permitted.

1. a) Let z be a fuzzy set defined by **6**

$$z = \frac{0.6}{x_1} + \frac{0.3}{x_2} + \frac{0.9}{x_3} + \frac{0.75}{x_4} + \frac{1}{x_5}$$

List all α − cuts and strong α cuts of z.

b) Write an illustrative note on following **any three.** **7**

i) Randomness of fuzzy sets / operations.

ii) Ambiguity of fuzzy sets / operations.

iii) Law of excluded middle of fuzzy operations.

iv) Law of contradiction of fuzzy operations.

OR

2. a) Draw Venn diagram to illustrate following fuzzy relations. **6**

i) Inter section ii) Complement

iii) Absorption iv) idempotency

b) Prove the following statements : **7**

i) Every fuzzy complement has at most one equilibrium.

ii) If C is a continuous fuzzy complement, then C has a unique equilibrium.

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| 3. | a) | Explain binary fuzzy relations. Explain its significance among n – dimentional relations. | 7 |
| | b) | Discuss adaptation algorithm to improve set point – control in adaptive fuzzy control. | 7 |

OR

| 4. | | Explain in short with block diagram representation of the design of P, PD, and PI type of FKBC (Fuzzy Knowledge Base Controller) representing an appropriate knowledge base (KB), fuzzy interface system (FIS) for input / output fuzzy sets. Assume suitable application. | 14 |

5.		Write a short notes on :	13
	i)	Adaptive feed forward / feedback fuzzy controller.	5
	ii)	Structure of FKBC.	4
	iii)	De Fuzzification strategies.	4

OR

| 6. | | Given two fuzzy numbers A & B as | 13 |

$$A(x) = 0; \text{ for } x < -2 \text{ and } x > 2$$
$$= \frac{x+2}{2}; \text{ for } -2 < x < 0$$
$$= \frac{2-x}{2}; \text{ for } 0 < x < 2$$
$$B(x) = 0; \text{ for } x < 2 \text{ and } x > 6$$
$$= \frac{x-2}{2}; \text{ for } 2 < x < 4$$
$$= \frac{6-x}{2}; \text{ for } 0 < x < 6$$

Find out fuzzy numbers $(A + B)$, $(A - B)$, $(A \cdot B)$ & (A / B)

| 7. | a) | Explain the different – steps involved in training of the neural network. What do you mean by supervised and unsupervised training process of neural networks. | 7 |
| | b) | Explain perception training algorithm for single mode perception neural network model. | 7 |

OR

| 8. | a) | Explain in brief storage capacity of Hopfield Network. | 7 |
| | b) | Explain the execution steps in concern with implementation of 'Counter propagation Algorithm NN'. | 7 |

| 9. | a) | Obtain the AND gate logic for a two i/p (external) AND – gate using single node perception based on perceptron training algorithm. Assume initial weight as zero. Show the classification on atleast 3 Nos of iterations $(i >= 3)$ | 7 |

Assume $x_0 = +1$
$$f(s) = +1; S \geq 0$$
$$= -1; S < 0$$

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b) Explain recurrent Associative memory storage and retrieval algorithm. **6**

OR

10. a) What do you mean by layered neural network. Explain in short **7**

    i) Acyclic NN

    ii) Cyclic NN

    iii) Feed forward NN

    iv) Modular NN

b) What do you mean by computing functions associated with numerical processing unit (node) of any neural network? Explain in short following computing function : **6**

    i) Unit step function

    ii) Signum function

    iii) Sigmoid function

11. Write short notes on **any three.**

    i) Perception learning rule. **5**

    ii) Recurrent Network. **4**

    iii) Supervised and Non supervised learning. **5**

    iv) Counter Propagation Network. **4**

OR

12. a) Explain Hamming network to calculate hamming distance between stored vector and input vectors to conduct unsupervised learning. **7**

b) Draw three layer feed – forward ANN model and describe its terminology and functioning in details. **6**

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