Total No. of Questions : 8]

SEAT No. :

P1814

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[5233] - 3003
M.Sc.
COMPUTER SCIENCE
CS - 303 : Soft Computing
(2013 Pattern) (Semester - III)

Time : 3 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

1) ***Attempt any five questions from given eight questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Use of simple calculator is allowed.***

Q1) Attempt the following:

a) Define artificial neural network. Explain the architectures of neural network. **[4]**

b) For the following two fuzzy sets find its union and intersection. **[4]**

$$\underset{\sim}{A} = \left\{\frac{0.15}{1} + \frac{0.25}{2} + \frac{0.6}{3} + \frac{0.9}{4}\right\}$$

$$\underset{\sim}{B} = \left\{\frac{0.2}{1} + \frac{0.3}{2} + \frac{0.5}{3} + \frac{0.8}{4}\right\}$$

c) Define support of a membership function. **[2]**

Q2) Attempt the following:

a) Write a note on properties of TLNS. **[4]**

b) For the following fuzzy relation matrix R, determine λ - cut relations for the following λ - values on R, λ_1, $\lambda_{0.8}$, $\lambda_{0.6}$, $\lambda_{0.3}$ **[4]**

$$R = \begin{bmatrix} 1 & 0.8 & 0.3 & 0.7 \\ 0.8 & 1 & 0.9 & 1 \\ 0.3 & 0.9 & 1 & 0.6 \\ 0.7 & 0.1 & 0.6 & 1 \end{bmatrix}$$

c) List out two advantages of genetic algorithms. **[2]**

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Q3) Attempt the following:

a) Using Genetic Algorithm maximize $f(x) = x^2 + 1$ with initial x values of (12, 25, 5, 19). Show one crossover and mutation operation. **[4]**

b) Write a note on fuzzy (Rule - Based) systems. **[4]**

c) What do you mean by error correction rule and gradient rule? **[2]**

Q4) Attempt the following: **[4]**

a) Consider the following fuzzy sets

$$\underset{\sim}{A} = \left\{\frac{0.1}{x_1} + \frac{0.9}{x_2} + \frac{0.0}{x_3}\right\}$$

and $$\underset{\sim}{B} = \left\{\frac{0}{y_1} + \frac{1}{y_2} + \frac{0}{y_3}\right\}$$

Determine the implication relation "IF A THEN B".

b) Write a note on perceptron learning algorithm. **[4]**

c) What is cluster validity in fuzzy classification? **[2]**

Q5) Attempt the following:

a) Consider the following fuzzy sets **[4]**

"Low temperature" = $$\left\{\frac{1}{40} + \frac{0.7}{50} + \frac{0.5}{60} + \frac{0.3}{70} + \frac{0}{80}\right\}$$

"High temperature" = $$\left\{\frac{0}{40} + \frac{0.2}{50} + \frac{0.4}{60} + \frac{0.7}{70} + \frac{1.0}{80}\right\}$$

Find the following membership functions

i) temperature not very low

ii) temperature not very high

iii) temperature not very low and not very high

b) State reasons how genetic algorithms are different from traditional algorithms. **[4]**

c) What is fuzzy tolerance relation. **[2]**

Q6) Attempt the following:

a) Simulate the execution of perceptron learning algorithm for each epoch on the following inputs (1, 0, 0) (1, 0, 1) (1, 1, 0) (1, 1, 1) with weight vector (0, 0, 0) and n = 1. What is the final weight vector? **[4]**

b) Consider the following fuzzy numbers. **[4]**

$$\underset{\sim}{A} = \text{“approximately 2”} = \left\{\frac{0.6}{1} + \frac{1}{2} + \frac{0.8}{3}\right\}$$

$$\underset{\sim}{B} = \text{“approximately 6”} = \left\{\frac{0.8}{5} + \frac{1}{6} + \frac{0.7}{7}\right\}$$

Using zadeh’s extension principle calculate fuzzy number “approximately 12”.

c) Write the equation for Gaussian signal function. **[2]**

Q7) Attempt the following:

a) List components of neural networks and explain them. **[5]**

b) Explain methods of defuzzification. **[5]**

Q8) Attempt the following:

a) Differentiate supervised and unsupervised learning. Explain any two application domain of neural network. **[5]**

b) Discuss strengths and limitations of Genetic Algorithms. **[5]**