Registration No. :

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B. Tech

PCIT 4401

Seventh Semester Examination – 2011

PRINCIPLES OF SOFT COMPUTING (For IT Branch)

Full Marks – 70

Time : 3 - Hours

*Answer Question No. 1 which is compulsory and any **five** from the rest.*

The figures in the right-hand margin indicate marks.

1. Answer the following in brief :   2×10

    (a) What is Fuzzy logic ? Give an example.

    (b) Why 'Perceptron learning' is called as a 'supervised learning' ? Explain.

    (c) Mention two 'classical' dissimilarities of 'GA' and 'traditional' search algorithms.

    (d) State two merits of an ART net.

    (e) What is 'leaky learning' ?

    (f) What is a fuzzy logic controller (FLC) ? Mention its various types.

    (g) Name two recurrent neural nets. Mention one functional difference between these.

    (h) 'Single pint crossover is more desired than bitwise mutation', why ?

    (i) What is angular fuzzy set ? Give an example.

    (j) Explain why generalized Ä rule is more useful that ordinary Ä rule in backpropagation?

2. (a) What is fuzzy 'λ -cut' ?   2

    (b) Using the 'inference' approach calculate the membership values for the fuzzy triangular shapes (L,R, and T) for a triangle with angles 45°, 65°, and 70°.   4

P.T.O.

(c) Determine the crisp λ-cut relation of the fuzzy set $A = \begin{bmatrix} 0.1, 0.2, 0.3, 0.01 \\ 0.4, 0.5, 0.1, 0.02 \\ 0.03, 0.01, 0, 0.41 \\ 0.98, 0.81, 0.001, 0 \end{bmatrix}$

   when $\lambda = 0.1, 0^+, 0.4,$ and 0.8.   4

3. (a) What is optimization ? Why it is important in 'Soft computing' ?   1

   (b) Consider a multilayer feed forward back propagation neural net having

       (i) three inputs (x1=0.1; x2 = 0.01, and x3=0.5) and uniform weights [W] of 0.45 for each input-hidden connectors,

       (ii) two hidden nodes, and

       (iii) one output node. The connector weights [V] between hidden and output nodes is 20% less than [W]. Assume linear transfer functions in the hidden and input layers and tan-sigmoidal function in the output layer, Target output is 1.0, and learning rate $(\alpha) = 0.75$, update [W] and [V] values for one epoch.   1+8

4. Write short notes on any *two* :   5×2

   (a) Radial basis function net: its structure and working principle.

   (b) ANFIS : steps of operations.

   (c) Real-coded GA : working principle.

5. (a) What is a hybrid system ? Why it is useful ?   1

   (b) Consider a GA-Fuzzy hybrid system, where a Sugeno's type of FLC is optimized by a binary coded GA. Describe its working principle with a neat schematic diagram.   1+8

6. Consider that a Mamdani's FLC will be developed using triangular membership function distributions for solving a robot navigation problem. The inputs are 'Distance' (D) between the robot and the obstacle and 'Angle' (A) for the motion planner. The output is the 'Deviation' (ä). The database and the rule bases are as follows :

DATABASE :

D:[VN(0.1–0.8); NR(0.4–1.4); FR(1,0-2.0)]   (VN=very near; NR=near; FR=far)

A:[ALT((−135°) − (−45°)); AH((−90°) − (45°)); ART((−22.5°) − (90°)] (ALT= ahead left; AH=ahead; ART=ahead right)

δ : [ALT((−135°)- (− 45°)); AH((−90°) − (45°)); ART((22.5°− (90°))] (ALT=ahead left; AH=ahead; ART=ahead right)

RULE BASE:

	VN	NR	FR
ALT	AH	ART	ALT
AH	ART	ALT	AH
ART	AH	AH	AH

Compute the δ for D=0.6 meter and A=30°.   10

7.   Maximize the following function for one generation and infer its average fitness compared to the previous generation as

$f(x)= y = x^2 + 2x$, subject to $0.5<=x<=1.0$ with the following initial solutions of population :

1.   11001110011
2.   10001111101
3.   10111100011
4.   10000001110
5.   10101000010
6.   11100000010

Consider single point crossovers at bit position 6 and 'nil' mutation.   10