Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 40690

M.E./M.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018.

Elective

Control and Instrumentation Engineering

IN 5091 — SOFT COMPUTING TECHNIQUES

(Common to Electrical Drives and Embedded Control/Instrumentation Engineering/ Power Electronics and Drives and Power Systems Engineering)

(Regulations 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Write down the weight updated equation of a back propagation algorithm.
2. Why is learning essential for a Neural Network with non linear units?
3. Give the characteristics of counter propagation network.
4. Why is Hopfield network called as recurrent neural network?
5. Compute the 0.5-level set of the fuzzy set $\tilde{A} = \{(a,0.3),(b,0.7),(c,0.4),(d,0.8)\}$.
6. Classify the methods of defuzzification.
7. How do you select mutation in GA?
8. Genetic algorithms can be seen as a combination of local and global search. If so, which of cross-over and mutations provides the local search and which the global one?
9. Write down the unique features of Particle Swarm Optimization.
10. Distinguish between State Vector Machine and Artifical Neural Network.

PART B — (5 × 13 = 65 marks)

11. (a) Design neural networks for two input XOR, NOR and three input NAND, NOR functions Using McCulloh-Pitts neuron model.

Or

(b) Derive the back propagation algorithm for 2-3-1 neural network with the activation function $1/(1+e^{-x})$.

12. (a) Compute the weight matrix for a 4-neuron Hopfield net with the single fundamental memory $\xi 1 = (1,-1,-1,1)$ stored in it.

Or

(b) (i) Prove that in successive iterations, the energy either decreases or remain same but never increases in a discrete Hopfield network. (8)

(ii) Brief about Hetro Associative memory and Auto associative memory. (5)

13. (a) Consider the following fuzzy expert system for weather forecast:

Rule	Condition	Action	Confidence
R1:	IF *arrow is down*	THEN *clouds*	$M = 0.8$
R2:	IF *arrow is in the middle* AND *moving down*	THEN *clouds*	$M = 0.6$
R3:	IF *arrow is in the middle* AND *moving up*	THEN *sunny*	$M = 0.6$
R4:	IF *arrow is up*	THEN *sunny*	$M = 0.8$

Two plots shown in Fig 13 (a) represent the membership functions of two fuzzy variables describing the position of the arrow of barometer (left) and the direction of its movement (right):

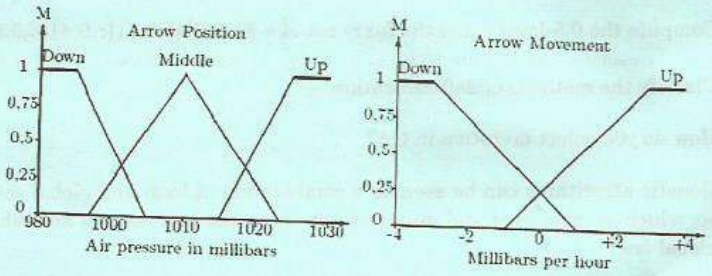

Fig. Q 13 (a)

The air pressure is measured in millibars, and the speed of its change in millibars per hour. Answer the following:

(i) How much is the arrow Down, Up or in the Middle if it indicates that the pressure is 1020 millibars? Use membership functions on the graphs.

(ii) How much is the arrow moving Down or Up if the pressure changes +2 millibars every hour?

(iii) Using the membership values found above and condences of the rules in the table calculate the degree of condence in that the sky is clear or cloudy.

Or

(b) Consider the fuzzy sets defined on the interval $X = [0,5]$ of real numbers, by the membership grade functions

$\mu(x) = X/(X+1)$, $\mu B(x) = 2^{-x}$.

Determine the mathematical formulae and graphs of the membership grade functions of each of the following sets.

(i) $A \cap B$

(ii) $A \cup B$

(iii) $(A \cup B)^C$.

14. (a) Explain the genetic operators and fitness function in respect of evolutionary computing with a suitable example.

Or

(b) Describe the sequential procedures involved in the cross over and reproduction phase of GA with suitable examples.

15. (a) Draw and discuss the architecture of ANFIS in detail. Also explain its applications.

Or

(b) With a suitable illustration explain the classification mechanism using support vector machine algorithm.

PART C — (1 × 15 = 15 marks)

16. (a) Consider a Neural Network (NN) interconnected system which consists of a set of NN models. Establish a linear differential inclusion state (LDI) space representation for the dynamics. By Lyaponov's direct method design the stability criteria for guaranteeing the asymptotic stability of NN interconnected systems.

Or

(b) Consider that a credit card company decided to deploy a new system for assessing credit worthiness of its customers. The new system is using a feed-forward neural network with a supervised learning algorithm. Suggest an algorithm with suitable illustration what should the bank have before the system can be used?

Discuss problems associated with this requirement with suitable architecture.
