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Question Paper Code : 40981

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2018
Seventh Semester
Electrical and Electronics Engineering
EE6006 – APPLIED SOFT COMPUTING
(Common to Electronics and Instrumentation Engineering/Instrumentation and Control Engineering)
(Regulations 2013)

Time : Three Hours Maximum : 100 Marks

Answer ALL questions

PART – A (10×2=20 Marks)

1. Define : supervised learning. Give an example.
2. Recall the architectural components of a neural network.
3. List the applications of artificial neural network.
4. What is activation function in NN ?
5. What is FAM Table ?
6. Define defuzzification.
7. Mention the key role of knowledge based systems.
8. Recall the assumptions in a Fuzzy Control System Design.
9. State Darwins theory of evolution.
10. Define : Cross over rate.

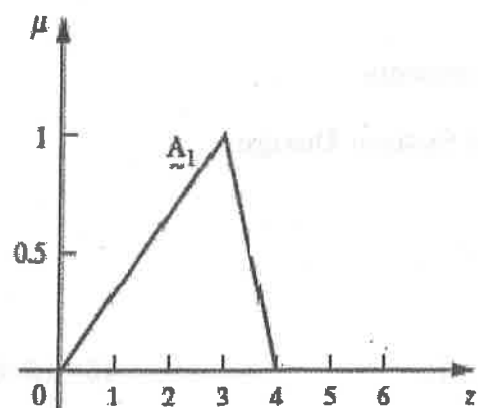
PART – B (5×16=80 Marks)

11. a) i) Compare Bio neuron with artificial neuron. (8)
ii) Compare supervised learning with unsupervised learning. (8)

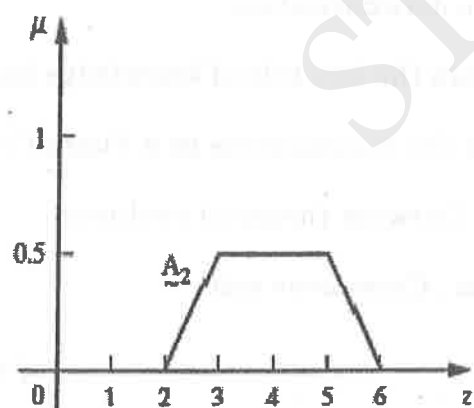
(OR)



- b) Examine the working principle of feed forward neural network and compare the activation used with other network models. Mention the error function and techniques used up to adjust the weights over the network. (16)
12. a) Illustrate the working principle of Hebbian learning rule for Hopfield networks. Draw and explain the architecture of discrete time Hopfield networks. (16)
- (OR)
- b) Demonstrate the workflow model of neural networks for control of Inverted pendulum. Illustrate its applicability by a mathematical model with parameters such as mass of pendulum, mass of cart, length of the bar, standard gravity and moment of inertia of the bar. Draw the free body diagrams for the cart and the pendulum. (16)
13. a) In metallurgy materials are made with mixtures of various metals and other elements to achieve certain desirable properties. In a particular preparation of steel, three elements, namely iron, manganese and carbon, are mixed in two different proportions. The samples obtained from these two different proportions are placed on a normalized scale, as shown in the figure and the represented as fuzzy sets A_1 and A_2 . You are interested in finding some sort of "average" steel proportion. For the logical union of the membership functions shown we want to find the defuzzified quantity. For each of the methods learned assess (i) whether each is applicable and, if so, ii) calculate the defuzzified value z^* . (16)



(a)



(b)

(OR)

- b) List and explain the different methods of assigning membership functions. (16)



14. a) Discuss briefly about the fuzzy rule base for the liquid level control system with a fuzzy rule function condition. (16)
- (OR)
- b) Let $A = \{(x_1, 0.2), (x_2, 0.7), (x_3, 0.4)\}$ and $B = \{(y_1, 0.5), (y_2, 0.6)\}$ be two fuzzy sets defined on the universe of discourse $X = \{x_1, x_2, x_3\}$ and $Y = \{y_1, y_2\}$ respectively. Find Cartesian product of A and B union, intersection of A and B, algebraic sum of A and B and algebraic product of A and B. (16)
15. a) Examine the steps involved in designing simple Genetic Algorithm by explaining population of binary strings, fitness function, selection, cross over and mutation operators. (16)
- (OR)
- b) Explain the step by step procedure for solving economic dispatch problems using genetic algorithms. (16)



11. a) Illustrate the working mechanism of single layered and multilayered neural network with an architectural diagram. Explain the competitive layer with the mechanism of setting weights over the network.

(OR)

b) Illustrate the algorithmic work flow of an un-supervised learning algorithm with its inputs, outputs and measures for evaluation.

12. a) Demonstrate the working paradigm of Hopfield neural network with clear architectural model. Compute the following for the training phase of the network with its periodic weight updates.

- Binary input patterns
- Bipolar input patterns

Depict clearly about the energy function evaluation over a stable condition.

(OR)

b) Demonstrate the workflow model of neural networks for control of inverted pendulum. Illustrate its applicability by a mathematical model with parameters such as mass of pendulum, mass of cart, length of the bar, standard gravity and moment of inertia of the bar. Draw the free body diagrams for the cart and the pendulum.

13. a) Five separate regions along the San Andreas fault in California have suffered damage from a recent earthquake. For purposes of assessing payouts from insurance companies to building owners, the five regions must be classified as to their damage levels. Expression of the damage in terms of relations will prove helpful. Surveys are conducted of the buildings in each region. All the buildings in each region are described as being in one of three damage states : no damage, medium damage and serious damage. Each region has each of these three damage states expressed as a percentage (ratio) of the total number of buildings. Hence, for this problem $n = 5$ and $m = 3$. The following table summarizes the findings of the survey team :

Regions	X_1	X_2	X_3	X_4	X_5
X_{i1} – ratio with no damage	0.3	0.2	0.1	0.7	0.4
X_{i2} – ratio with medium damage	0.6	0.4	0.6	0.2	0.6
X_{i3} – ratio with serious damage	0.1	0.4	0.3	0.1	0.0

Discover the fuzzy relation method used up for the above data. Compute the fuzzy relationship and tolerance relation.

(OR)



b) One of the decisions your project team faces with each new computer product is what type of Printed Circuit Board (PCB) will be required for the unit. Depending on the density of tracks (metal interconnect traces on the PCB that act like wire to connect components together), which is related to the density of the components, we may use a single-layer PCB, a double-layer PCB, a four-layer PCB, or a six-layer PCB. A PCB layer is a two-dimensional plane of interconnecting tracks. The number of layers on a PCB is the number of parallel interconnection layers in the PCB. The greater the density of the interconnections in the design, the greater the number of layers required to fit the design onto a PCB of given size. One measure of board track density is the number of nodes required in the design. A node is created at a location in the circuit where two or more lines (wires, tracks) meet.

Investigate the following for proper decision making logic over the described system.

- 1) Define the fuzzy states of nature.
- 2) Calculate fuzzy alternatives.
- 3) Illustrate orthogonal fuzzy information system.
- 4) Show the prior probabilities.
- 5) Use new data samples for computation.
- 6) Produce the utility values.

14. a) Demonstrate the mechanism of fuzzy rule based Aircraft Landing System with its fuzzy conditions.

(OR)

b) Illustrate the concept of Speed Control of DC Motor using Fuzzy PID Controller.

15. a) Examine the steps involved in designing simple Genetic Algorithm by explaining population of binary strings, control parameters, fitness function, genetic operators, selection mechanism with encoding.

(OR)

b) Differentiate the terms gradient and non-gradient searches with accordance to the algorithmic workflow, representation in addition to time and space complexity. Give examples for each category.

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Question Paper Code : 50463

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2017

Seventh Semester

Electrical and Electronics Engineering

EE 6006 – APPLIED SOFT COMPUTING

**(Common to Electronics and Instrumentation Engineering/Instrumentation and Control Engineering)
(Regulations 2013)**

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions.

PART – A (10×2=20 Marks)

1. List the major applications in which Neural Networks have been used.
2. Recall the structure of a simple neuron and give its activation function for logistic sigmoid function.
3. Differentiate in between supervised and unsupervised learning.
4. Describe the operations on fuzzy relations.
5. What is fuzzy logic based control system ?
6. Mention some applications of fuzzy logic.
7. Discuss the assumptions in a fuzzy control system design.
8. Memorize the workflow of a simple fuzzy logic control system.
9. Define fuzzification.
10. Describe the term "Mutation" in genetic algorithm.

Reg. No. :



Question Paper Code : 20437

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

Sixth/Seventh Semester

Electrical and Electronics Engineering

EE 6006 — APPLIED SOFT COMPUTING

(Common to Electronics and Instrumentation Engineering, Instrumentation and Control Engineering)

(Regulations 2013)

(Also common to PTEE 6006 – Applied Soft Computing for B.E. (Part-Time) Sixth Semester – Electrical and Electronics Engineering – Regulations 2014)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. List out the differences between artificial neural network and biological network.
2. What are merits and demerits of Back Propagation Algorithm?
3. What is a feedback networks? Give some examples of feedback networks.
4. What is the goal of inverted pendulum?
5. State the excluded middle laws and De Morgan's laws for classical sets.
6. Define core and boundaries of a membership function.
7. What are the basic elements of a fuzzy logic control system?
8. List some of the applications of fuzzy logic control system.
9. State the different selection methods in GA.
10. What is binary Encoding in GA?

PART B — (5 × 13 = 65 marks)

PART C — (1 × 15 = 15 marks)

11. (a) Briefly explain about the architecture, flowchart and training algorithm of Back-propagation network. (13)

Or

(b) (i) What is learning? Discuss about the different learning process. (7)

(ii) Explain about the different types of neuron connection architecture. (6)

12. (a) (i) Explain in detail about the discrete Hopfield network by its architecture. (7)

(ii) Analyse and derive the energy function of continuous Hopfield network. (6)

Or

(b) What is Neuro-controller? Why Neuro-controller is preferred for the inverted pendulum operation? Explain in detail. (13)

13. (a) (i) Given the two fuzzy sets, find the following : (7)

$$\underline{B}_1 = \left\{ \frac{1.0}{1.0} + \frac{0.75}{1.5} + \frac{0.3}{2.0} + \frac{0.15}{2.5} + \frac{0.0}{3.0} \right\}, \underline{B}_2 = \left\{ \frac{1.0}{1.0} + \frac{0.6}{1.5} + \frac{0.2}{2.0} + \frac{0.1}{2.5} + \frac{0.0}{3.0} \right\}$$

(1) $\underline{B}_1 \cup \underline{B}_2$; (2) $\underline{B}_1 \cap \underline{B}_2$ (3) $\underline{B}_1 \cap \overline{\underline{B}_1}$ (4) $\underline{B}_1 / \underline{B}_2$.

(ii) Discuss fuzzy Bayesian Decision making in detail. (6)

Or

(b) What is the membership function? Explain in detail about the methods of membership value assignment. (13)

14. (a) Why we use fuzzy logic control for aircraft landing and explain the operation and working principles of aircraft landing with neat schematic diagram? (13)

Or

(b) With neat flowchart describe the algorithm of fuzzy based motor control. (13)

15. (a) (i) Describe the binary and real representation schemes of chromosomes in GA. (6)

(ii) What is selection? Explain the different selection methods. (7)

Or

(b) (i) How constraints are handled in GA? Discuss. (6)

(ii) Explain how GA can be used to solve unit commitment problem. (7)

16. (a) (i) Describe a Neuro controller for inverted pendulum. (5)

(ii) With the help of neat flowchart explain the algorithm of fuzzy based liquid level control. (10)

Or

(b) Explain in detail different search techniques in Genetic Algorithm. Discuss its merits and demerits. (15)