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Subject Code:- ACSE0307

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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: III - CARRY OVER THEORY EXAMINATION - APRIL 2023

Subject: Soft Computing

Time: 3 Hours

Max. Marks: 100

General Instructions:

IMP: Verify that you have received the question paper with the correct course, code, branch etc.

1. This Question paper comprises of **three Sections -A, B, & C.** It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.

2. Maximum marks for each question are indicated on right -hand side of each question.

3. Illustrate your answers with neat sketches wherever necessary.

4. Assume suitable data if necessary.

5. Preferably, write the answers in sequential order.

6. No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION A

20

1. Attempt all parts:-

1-a. Each connection link in ANN is linked with _____ that contains statics about the input signal. (CO1) 1

- (a) Neurons
- (b) Activation Function
- (c) Weights
- (d) Bias

1-b. Neural Computing _____. (CO1) 1

- (a) mimics human brain
- (b) information processing paradigm
- (c) Both mimics human brain and information processing paradigm
- (d) None of the above

1-c. A perceptron can be defined as _____. (CO2) 1

- (a) A double layer auto-associative neural network
- (b) A neural network with feedback

- (c) An auto-associative neural network
- (d) A single layer feed-forward neural network with pre-processing
- 1-d. What is the name of the network, which includes backward links from the output to the inputs as well as the hidden layers? (CO2) 1
- (a) Perceptron
- (b) Self-organizing maps
- (c) Multi-layered perceptron
- (d) Recurrent neural network
- 1-e. The Union of two fuzzy sets is the _____ of each element from two sets. (CO3) 1
- (a) maximum
- (b) minimum
- (c) equal to
- (d) not equal to
- 1-f. Given two fuzzy set A and B = {(1,0.5), (2, 0.1), (3, 0.4)} and C = {(1, 0.2), (2, 0.3), (3, 0.5)} Then Intersection of the two fuzzy set i.e. $A \cap B$ is given by _____ (CO3) 1
- (a) {(1, 0.5), (2, 0.1), (3, 0.4)}
- (b) {(1, 0.5), (2, 0.3), (3, 0.5)}
- (c) {(1, 0.2), (2, 0.3), (3, 0.5)}
- (d) {(1, 0.2), (2, 0.1), (3, 0.4)}
- 1-g. Which of the following represents the values of set membership? (CO4) 1
- (a) Degree of truth
- (b) Probabilities
- (c) Discrete set
- (d) Both Degree of truth and Probabilities
- 1-h. Which of the following is associated with fuzzy logic? (CO4) 1
- (a) Crisp set logic
- (b) Many-valued logic
- (c) Two-valued logic
- (d) Binary set logic
- 1-i. If the parent solutions are 1110111 and 1010101 and if the crossover site is 5, which of the following indicates one of the new offspring (CO5) 1
- (a) 1110101

(b) 1110011

(c) 1010001

(d) 1110110

1-j. What is the name of the process that represents modified elements of the DNA? (CO5) 1

(a) Selection

(b) Mutation

(c) Recombination

(d)

None

2. Attempt all parts:-

2.a. Define Soft Computing. Explain the characteristics of Soft computing. (CO1) 2

2.b. Define Activation Function in ANN. (CO2) 2

2.c. Why fuzzy sets are better in comparison to normal sets? (CO3) 2

2.d. Define Fuzzy Inference Systems. (CO4) 2

2.e. What are the basic components of genetic algorithms? (CO5) 2

SECTION B 30

3. Answer any five of the following:-

3-a. How human brain works? And how the working of artificial intelligence is related to human brain working? (CO1) 6

3-b. Differentiate between Soft computing vs. Hard computing. (CO1) 6

3-c. Explain supervised, unsupervised and reinforcement learning in detail. (CO2) 6

3-d. Explain with a neat diagram the neural network architecture of multilayer feed forward network. (CO2) 6

3.e. Suppose two fuzzy sets are given - (CO3) 6

$\tilde{A} = \{(1,0.2) (2,0.5) (3,0.8) (4,1)\}$ and $\tilde{I} = \{(1,0.3) (2,0.6) (3,0.9) (4,1)\}$

Then find -

i. Height of both fuzzy sets

ii. $\tilde{A} \cup \tilde{I}$

iii. $\tilde{A} \cap \tilde{I}$

iv. Complement of both fuzzy sets

3.f. Explain fuzzification and defuzzification process for air conditioner controller. (CO4) 6

3.g. Draw and Discuss the Flow Chart of Genetic Algorithm. (CO5) 6

SECTION C

50

4. Answer any one of the following:-

4-a. Explain Various types of Soft Computing Techniques in detail. (CO1) 10

4-b. Describe the applications of Soft Computing in details. (CO1) 10

5. Answer any one of the following:-

5-a. Define an artificial neural network. State the characteristics of an artificial neural network. (CO2) 10

5-b. Describe Perceptron in neural network. Explain Adaline and Madaline Neural Network with diagram in detail. (CO2) 10

6. Answer any one of the following:-

6-a. If $\tilde{I} = \{(F, 0.4) (E, 0.3) (X, 0.1) (Y, 0.1) (K, 0.9) (T, 0.8)\}$ and $\tilde{N} = \{(F, 0.99) (E, 0.8) (X, 0.1) (Y, 0.2) (K, 0.5) (T, 0.5)\}$, (CO3) 10
then verify Demorgan's Law using these given fuzzy sets.

6-b. Two fuzzy sets $\tilde{A}$ and $\tilde{I}$ defined on the interval $X = [0, 5]$ of real number, by the membership grade functions $\mu_A(X) = X/X+1$, $\mu_I(X) = 2-X$ (CO3) 10
Determine the mathematical formulae and graphs of the membership grade functions for following set:
i) A^c , B^c
ii) $A \cup B$
iii) $A \cap B$

7. Answer any one of the following:-

7-a. What is defuzzification and why is it required? Explain mean of maxima and center of sum method. (CO4) 10

7-b. What are the different methods of fuzzy to crisp conversion process? Discuss in detail. (CO4) 10

8. Answer any one of the following:-

8-a. What are the various types of mutation techniques in soft computing? Also explain their types. (CO5) 10

8-b. What is meant by survival of the fittest and give one specific example? (CO5) 10