Printed Page:- 03

Subject Code:- BEC0304

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: III - THEORY EXAMINATION (2024 - 2025)

Subject: Computational Intelligence

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. Which of the following is NOT a characteristic of computational intelligence? (CO1, K1) 1

(a) Adaptivity

(b) Knowledge representation

(c) Stochastic search methods

(d) Fixed algorithmic rules

1-b. Which of the following is NOT a component of computational intelligence? (CO1, K1) 1

(a) Fuzzy logic

(b) Machine learning

(c) Evolutionary algorithms

(d) Hard coding deterministic algorithms

1-c. What is the basic computational unit of an artificial neural network? (CO2, K3) 1

(a) Neuron

(b) Perceptron

(c) Synapse

(d) Layer

1-d. Which activation function in neural networks is commonly used? (CO2, K3) 1

(a) Rectified Linear Unit (ReLU)

(b) Linear Function

(c) Exponential Function

(d) Fourier Function

1-e. Consider the following: Universe U={X1,X2,X3}Fuzzy sets A={0.2/X1,0.7/X2,0.6/X3} and B={0.7/X1,0.3/X2,0.5/X3}Find AUB: (CO3, K2) 1

(a) AUB={0.2/X1,0.7/X2,0.6/X3}

(b) AUB={0.7/X1,0.7/X2,0.3/X3}

(c) AUB={0.7/X1,0.7/X2,0.6/X3}

(d) AUB={0.2/X1,0.3/X2,0.5/X3}

1-f. Which of the following is not a Fuzzy membership function? (CO3, K2) 1

(a) Trapezoidal membership function

(b) Triangular membership function

(c) Gaussian membership function

(d) Sinusoidal membership function

1-g. What is the main purpose of defuzzification in fuzzy logic? (CO4, K3) 1

(a) To convert crisp inputs into fuzzy sets

(b) To simplify the fuzzy rule base

(c) To transform fuzzy outputs into crisp values

(d) To generate a rule base for fuzzy inference

1-h. The Mean of Maximum (MoM) defuzzification method calculates: (CO4, K3) 1

(a) The mean of all possible crisp values

(b) The average of all values with the maximum membership grade

(c) The center of the entire fuzzy set

(d) The value with the lowest membership grade

1-i. Which is NOT a component of a genetic algorithm? (CO5, K1) 1

(a) Selection

(b) Mutation

(c) Inheritance

(d) Compilation

1-j. The fitness function in a genetic algorithm is used to: (CO5, K1) 1

(a) Rank individuals based on their quality

(b) Select solutions for elimination

(c) Perform crossover between solutions

(d) Mutate the population

2. Attempt all parts:-

2.a. Define term Computational Intelligence. (CO1, K1) 2

2.b. Design single layer ANN model. (CO2, K3) 2

2.c. Write application of Fuzzy logic. (CO3, K2) 2

2.d.	Explain Fuzzy Rule based system. (CO4, K3)	2
2.e.	Expalin the effect of Mutation in Evolutionary Computation. (CO5, K3)	2

SECTION-B 30

3. Answer any five of the following:-

3-a.	Write Characteristics of computational Intelligence. (CO1, K1)	6
3-b.	How human brain is related to ANN? (CO1, K1)	6
3-c.	With graphical representations, explain the different types of Activation functions used in Artificial Neural Networks. (CO2, K3)	6
3-d.	Explain the working of Adaline neural network with suitable diagram. (CO2, K2)	6
3.e.	A = {(x1,0.7),(x2,0.3),(x3,0.2),(x4,0.1)}, B = {(x1,0.6),(x2,0.5),(x3,0.6),(x4,0.2)} Calculate the several operation of the fuzzy set. (CO3, K2)	6
3.f.	What are the components of fuzzy logic controller? Explain them in detail with block diagram. (CO4, K3)	6
3.g.	Discuss about the basic operators of the genetic algorithm? (CO5, K2)	6

SECTION-C 50

4. Answer any one of the following:-

4-a.	Discuss five different applications of computational intelligence. (CO1, K1)	10
4-b.	What are major areas of Computational Intelligence? (CO1, K1)	10

5. Answer any one of the following:-

5-a.	Differentiate between Biological Neural Networks and Artificial neural network. (CO2, K3)	10
5-b.	Draw and explain the Multilayer Feedforward ANN model through an appropriate example. (CO2, K3)	10

6. Answer any one of the following:-

6-a.	Explain cartesian product operation. If there are two sets with values A = {(x1,0.5),(x2,0.1),(x3,0.4)}, B = {(y1,0.2),(y2,0.3),(y3,0.5)} then, calculate AXB relation matrix. (CO3, K2)	10
6-b.	Explain fuzzy composition operations with example. (CO3, K2)	10

7. Answer any one of the following:-

7-a.	Discuss the following components of fuzzy logic system: (a) Fuzzification. (b) Rule base. (CO4, K3)	10
7-b.	Explain Air Conditioner Control using fuzzy logic. (CO4, K3)	10

8. Answer any one of the following:-

8-a.	Explain different cross over operations performed in GA. (CO5, K2)	10
8-b.	List and Explain in brief various Selection methods of Reproduction in GA. (CO5, K4)	10