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B.Tech DEGREE EXAMINATION, NOVEMBER 2023

Seventh Semester

18AUE313T - ARTIFICIAL NEURAL NETWORKS AND FUZZY LOGIC

(For the candidates admitted during the academic year 2020 - 2021 & 2021 - 2022)

Note:

i. **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.

ii. **Part - B** and **Part - C** should be answered in answer booklet.

Time: 3 Hours **Max. Marks: 100**

PART - A (20 × 1 = 20 Marks)

Answer **all** Questions

		Marks	BL	CO
1.	Which of the following is a supervised learning algorithm? (A) K-Means (B) DBSCAN (C) Linear Regression (D) t-SNE	1	1	1
2.	What is the input layer in a neural network responsible for? (A) Applying activation functions (B) Providing the network with raw data (C) Backpropagation (D) Pooling information	1	2	1
3.	What do you call the variables that adjust themselves during learning in a neural network? (A) Neurons (B) Gradients (C) Weights (D) Labels	1	2	1
4.	Which type of learning algorithm uses labeled data to train the model? (A) Supervised learning (B) Unsupervised learning (C) Reinforcement learning (D) Semi-supervised learning	1	1	1
5.	What is the primary characteristic of a feed forward neural network? (A) Cycles or loops between neurons (B) Data flows in one direction, from input to output (C) Continuous feedback to input layers (D) Memory retention across sequences	1	2	2
6.	In a feed forward neural network, what layer is responsible for producing the final predictions? (A) Hidden layer (B) Input layer (C) Convolutional layer (D) Output layer	1	2	2
7.	Which algorithm is used alongside back propagation to adjust the weights in a neural network? (A) K-Means (B) Principal Component Analysis (PCA) (C) Gradient Descent (D) Decision Trees	1	3	2
8.	What role does the loss function play in back propagation? (A) Determines the architecture of the neural network (B) Provides initial weights for the neurons (C) Measures the difference between the actual and predicted output (D) Acts as the activation function for the hidden layers	1	2	2

9. Which of the following best defines a fuzzy set? 1 2 3

(A) A set with clear boundaries between its members and non-members.
(B) A set where elements have degrees of membership between 0 and 1.
(C) A set that contains only integers.
(D) A set defined by a probability distribution.

10. What is the primary difference between crisp sets and fuzzy sets? 1 2 3

(A) Crisp sets have elements with degrees of membership.
(B) Fuzzy sets do not allow overlapping between sets.
(C) Crisp sets have a clear boundary for membership, while fuzzy sets do not.
(D) Fuzzy sets can only have integer values.

11. Which of the following is a common application of fuzzy logic? 1 2 3

(A) Text processing
(B) Financial analysis
(C) Control systems
(D) Cryptography

12. If an element has a membership degree of 0.7 in a fuzzy set A, what will be its membership degree in the complement of A? 1 3 3

(A) 0.3
(B) 0.7
(C) 1.0
(D) 0.0

13. What is the primary function of a fuzzy logic controller (FLC)? 1 2 4

(A) To operate using binary logic only.
(B) To map crisp input values to crisp output values.
(C) To transform a fuzzy set into a crisp value.
(D) To make decisions based on vague or imprecise information.

14. In a fuzzy logic controller, what is the role of defuzzification? 1 2 4

(A) Convert crisp inputs into fuzzy sets.
(B) Combine multiple fuzzy rules.
(C) Convert fuzzy outputs back into crisp values.
(D) Determine membership function shapes.

15. In a fuzzy logic controller, the "rule base" contains: 1 2 4

(A) The crisp input and output values.
(B) The defuzzification methods available.
(C) A collection of fuzzy if-then rules.
(D) The history of all control actions taken.

16. Why the designer to choose a fuzzy logic controller over a traditional controller? 1 3 4

(A) FLCs are always faster in computation.
(B) FLCs can work without any rules or knowledge base.
(C) FLCs can be intuitively designed based on expert knowledge without requiring precise mathematical models.
(D) FLCs provide a clearer distinction between ON and OFF states.

17. What is a neuro-fuzzy system primarily designed to achieve? 1 2 5

(A) Reduce neural network computation time.
(B) Implement fuzzy logic in binary systems.
(C) Combine the learning capability of neural networks with the linguistic representation power of fuzzy logic.
(D) Replace traditional neural networks.

18. Adaptive Neuro-Fuzzy Inference Systems (ANFIS) are primarily used for: 1 2 5

(A) Clustering tasks.
(B) Function approximation.
(C) Image recognition.
(D) Speech synthesis.

19.	What differentiates a neuro-fuzzy system from a traditional fuzzy system? (A) The elimination of if-then rules. (B) The ability to automatically tune membership functions based on data. (C) Operating exclusively in the fuzzy domain. (D) Ignoring input-output data relations.	1	2	5
20.	Which application could benefit from the interpretability of a neuro-fuzzy system? (A) Password hashing (B) Medical diagnosis (C) Graphics rendering (D) Data compression	1	3	5

PART - B (5 × 4 = 20 Marks)

Answer **any 5** Questions

		Marks	BL	CO
21.	Compare human brain and traditional computers.	4	4	1
22.	How back-propagation is used to reduce errors in machine learning?	4	3	1
23.	What is perceptron and logistic neuron?	4	2	2
24.	List any four algorithm for low dimension datasets.	4	2	2
25.	What is linguistic variable and term in fuzzy set theory?	4	2	3
26.	Justify the need of PID controllers with practical applications.	4	3	4
27.	Give an overview about Neuro-fuzzy systems.	4	1	5

PART - C (5 × 12 = 60 Marks)

Answer **all** Questions

		Marks	BL	CO
28.	(a) Explain supervised learning? Brief about regression analysis and suggest the possibilities related to accuracy and convergence. **(OR)** (b) "Developing a system where a car adjusts its own suspension settings based on continuous feedback from the road conditions to achieve the optimal ride quality." Suggest a suitable machine learning approach and explain briefly by assuming suitable data.	12	3	1
29.	(a) Compare feed forward and Back propagation neural networks? **(OR)** (b) Explain the need of Multi-layer neural network over single-layer neural network. Justify with example?	12	2	2
30.	(a) Compare triangular, trapezoidal and Gaussian membership function in fuzzy sets. **(OR)** (b) Explain fuzzy if-then rule base with any application.	12	2	3
31.	(a) Brief about the application of fuzzy logic controller in Anti-lock braking systems. **(OR)** (b) Brief about the application of fuzzy logic controller in Automotive Gearboxes.	12	4	4
32.	(a) Explain the Microcontroller based implementation of Automotive Air-conditioning unit. **(OR)** (b) What does the need of fuzzy-neuro controller explain with any practical applications?	12	2	5

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