

1. Any soft-computing methodology is characterized with

- (a) precise solutions
- (b) control actions are unambiguous and accurate
- (c) extensive mathematical model of the problem to be investigated
- (d) algorithm which can easily adapt with the change of dynamic environment

2. Given that

R1: IF x is A THEN z is C

R2: IF y is B THEN z is c

Then, the Fuzzy rule "IF x is A OR y is B THEN z is C" can be expressed as (with all symbols bearing usual meaning)

- (a) $(A \times B) + (B \times C)$
- (b) $(A \times B) \rightarrow C$
- (c) $(A \times B) \rightarrow (B \times C)$
- (d) $(A \times C) \cup (B \times C)$

3. If A and B are two fuzzy sets and $x \in A, y \in B$. Let $C = A \oplus B$. Then

- (a) $\mu_C(x, y) = \min\{\mu_A(x), \mu_B(y)\}$
- (b) $\mu_C(x, y) = \min\{1, \mu_A(x) + \mu_B(y)\}$
- (c) $\mu_C(x, y) = \max\{0, \mu_A(x) + \mu_B(y) - 1\}$
- (d) $\mu_C(x, y) = \max\{\mu_A(x), \mu_B(y)\}$

4. The **support** of Fuzzy set A is the set of all points x in X (is the universe of discourse) such that

- (a) $\mu_A(x) > 0$
- (b) $\mu_A(x) = 1$
- (c) $\mu_A(x) = 0.5$
- (d) $\mu_A(x) \neq 1$

5. A transfer function $f(I)$ with transfer coefficient α follows its partial derivative with respect to input I as $\frac{\partial f}{\partial I} = \alpha f(I)(1 - f(I))$. The transfer function is most likely the

- (a) Linear transfer function
- (b) Log-sigmoid transfer function
- (c) Tan-sigmoid transfer function
- (d) Hard limit transfer function

6. If x is A then y is B else y is C . The output of the above fuzzy rule is
- (a) a fuzzy set
 - (b) a crisp set
 - (c) a fuzzy relation
 - (d) a membership function
7. Given two Fuzzy sets A and B with MFs μ_A and μ_B , respectively where μ_A is of m -dimensional MF and μ_B n -dimensional MF. A relation $R = A \times B$ can be represented with
- (a) Two dimensional matrix of size $m \times n$
 - (b) $m \times n$ dimensional matrix
 - (c) Two dimension matrix of size $p \times q$ where $p = |A|$ and $q = |B|$
 - (d) $p \times q$ dimensional matrix of size $m \times n$ where $p = |A|$ and $q = |B|$
8. Given that " x is Sweet" with $T(x) = 0.8$ and " y is Sweet" with $T(y) = 0.6$. The Fuzzy truth value of " $If\ x\ is\ Sweet\ then\ y\ is\ Sweet$ " is
- (a) 0.4
 - (b) 0.2
 - (c) 0.8
 - (d) 0.6
9. An equivalence between *Fuzzy vs. Probability* to that of *Prediction vs. Forecasting* is
- (a) *Fuzzy \approx Prediction*
 - (b) *Probability \approx Prediction*
 - (c) *Fuzzy \approx Forecasting*
 - (d) *Probability \approx Forecasting*
10. One difference between Mamdani approach and Takagi-Sugeno approach to FLC design is that
- (a) Mamdani approach needs defuzzification module whereas Takagi-Sugeno approach does not
 - (b) Mamdani approach is easy to interpret but less accurate
 - (c) Takagi-Sugeno approach does not require any fuzzification module whereas Mamdani approach needs
 - (d) Takagi-Sugeno approach is less interpretable but more accurate
11. For the same size of training data as input, the fastest learning techniques is
- (a) Supervised training with error correction.
 - (b) Supervised training with stochastic method.
 - (c) Supervised training without error calculation.
 - (d) Supervised training with Hebbian method.

12. In case of layer calculation, the maximum time involved in
- (a) Output layer computation.
 - (b) Hidden layer computation.
 - (c) **Equal effort in each layer.**
 - (d) Input layer computation.
13. The **Back Propagation Learning** algorithm is used to train
- (a) a single layer feed forward neural network only
 - (b) a multiple layer feed forward neural network only
 - (c) a recurrent neural network only
 - (d) **any artificial neural network**
14. Which of the following are not necessarily an essential neural network parameters.
- (a) Weight matrices.
 - (b) **Value of l, m and n in $l - m - n$ network.**
 - (c) Threshold values.
 - (d) Transfer functions.
15. If the problem is to classify input patterns, then the more preferred type of learning is/are is
- (a) Reinforced learning.
 - (b) **Unsupervised learning with competitive method.**
 - (c) Supervised with error calculation.
 - (d) **Unsupervised learning with Habbian method.**
16. Which of the following logic can not be modelled with a single neuron.
- (a) 3 – AND
 - (b) **3 – XOR**
 - (c) NOT
 - (d) **(A XOR B) AND (A OR C)**
17. Both fuzzy logic and artificial neural network are soft computing techniques because,
- (a) Both gives precise and accurate results.
 - (b) Artificial neural network gives accurate result but fuzzy logic does not.
 - (c) **In each, no precise mathematical model of the problem is required.**
 - (d) Fuzzy gives exact result but artificial neural network does not.
18. An ANN learn quickly if η , the learning rate assumes the following value(s).
- (a) $\eta = 1$
 - (b) $\eta < 1$
 - (c) **$\eta > 1$**
 - (d) $\eta = 0$

19. Which of the following is true for neural networks?

- (i) The training time depends on the size of the network.
- (ii) Neural networks can be simulated on a conventional computer.
- (iii) Artificial neurons are identical in operation to biological ones.

- (a) (i) and (ii) are true
- (b) (i) and (iii) are true
- (c) (ii) is true.
- (d) all of them are true

20. Which of the following is true for neural networks?

- (i) The error calculation which is followed in “Back-propagation algorithm” is the steepest descent method.
- (ii) Simulated annealing approach is followed in unsupervised learning.
- (iii) A problem whose output is linearly separable can also be solved with MLFFNN.
- (iv) The output of the perceptron with hard limit transfer function is more accurate than it is defined with any sigmoid transfer function.

- (a) (i) and (iii) are true
- (b) (i) and (ii) are true
- (c) (ii) and (iv) are true
- (d) all are true