

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  $\alpha$  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  $\mu_A$  and  $\mu_B$ , respectively where  $\mu_A$  is of  $m$ -dimensional MF and  $\mu_B$   $n$ -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)  **$(A \text{ XOR } B) \text{ AND } (A \text{ OR } C)$**
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  $\eta$ , 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