Introduction to Soft Computing

Assignment 2

TYPE OF QUESTION: MCQ

Number of questions: 15 Total mark: 15 × 1 = 15

QUESTION 1:

P: Jack is intelligent; T(P) = 0.6
Q: Jill is intelligent; T(Q) = 0.8

Fuzzy proposition of "Either Jack or Jill is efficient" will be

a. 0.6
b. 0.8
c. 0.2
d. 0.4

Correct Answer: b
Explanation: Either Jack or Jill is efficient is given by

$$T(P \vee Q) = max\{T(P), T(Q)\} = 0.8$$

QUESTION 2:

The degree of truth value of fuzzy proposition is

a. Either 1 or 0
b. Between -1 to 1
c. Interval [0,1] both inclusive
d. Any value in the universe

Correct Answer: c
Explanation: The degree of truth of each fuzzy proposition is expressed by a value in the interval [0,1] both inclusive.

QUESTION 3:

Given a statement: “If mango is yellow then mango is sweet”. It is a

a. Fuzzy proposition
b. Fuzzy inference
c. Crisp rule
d. Fuzzy implication

Correct Answer: d
Explanation: A fuzzy implication (also known as fuzzy if-then rule) assumes the form: If x is A then y is B. Where A and B are two linguistic variables defined by fuzzy sets A and B.

QUESTION 4:

Which of the following operator is not used to interpret “A coupled with B”?

a. Drastic product
b. Bounded product
c. Minimum.
d. Maximum.

Correct Answer: d
Explanation: The detailed description can be found in Week 2 Lecture material – Page no. 22.

QUESTION 5:

Let X= {a, b, c} Y= {1, 2, 3}
and A= {(a,0.1), (b,0.6), (c,0.1)}

B= {(1,0.3), (2,0.2), (3,1.0)}

Determine the implication relation: $If\ x\ is\ A\ then\ y\ is\ B$

a.

	1	2	3
a	0.9	0.9	0.9
b	0.4	0.4	0.4
c	0.9	0.9	0.9

b.

c.

	1	2	3
a	0.9	0.9	0.9
b	0.4	0.4	0.6
c	0.9	0.9	0.9

d.

	1	2	3
a	0.1	0.1	0.1
b	0.3	0.2	0.6
c	0.1	0.1	0.1

e.

	1	2	3
a	0.9	0.9	0.9
b	0.4	0.4	0.4
c	0.1	0.1	0.1

Correct Answer: b

Explanation: The detailed description can be found Week 2 Lecture material – Page no 29-31.

A= {(a,0.1), (b,0.6), (c,0.1)}

B= {(1,0.3), (2,0.2), (3,1.0)}

$\bar{A}$= {(a,0.9), (b,0.4), (c,0.9)}

A × B=

$$\begin{array}{c} \\ a \\ b \\ c \end{array}\begin{array}{c} \begin{array}{ccc} 1 & 2 & 3 \end{array} \\ \begin{bmatrix} 0.1 & 0.1 & 0.1 \\ 0.3 & 0.2 & 0.6 \\ 0.1 & 0.1 & 0.1 \end{bmatrix} \end{array}$$

$\bar{A}$ × Y =

$$\begin{array}{c} \\ a \\ b \\ c \end{array}\begin{array}{c} \begin{array}{ccc} 1 & 2 & 3 \end{array} \\ \begin{bmatrix} 0.9 & 0.9 & 0.9 \\ 0.4 & 0.4 & 0.4 \\ 0.9 & 0.9 & 0.9 \end{bmatrix} \end{array}$$

$(A \times B) \cup (\bar{A} \times Y)$ =

$$\begin{array}{c} \\ a \\ b \\ c \end{array}\begin{array}{c} \begin{array}{ccc} 1 & 2 & 3 \end{array} \\ \begin{bmatrix} 0.9 & 0.9 & 0.9 \\ 0.4 & 0.4 & 0.6 \\ 0.9 & 0.9 & 0.9 \end{bmatrix} \end{array}$$

QUESTION 6:

Consider a fuzzy set Old as defined below.

Old = {(20, 0.1), (30, 0.2), (40, 0.4), (50, 0.6), (60, 0.8), (70, 1), (80, 1)}

Then the lambda-cut for λ = 0.5 for the set old will be

a. {20, 30}
b. {20, 30, 40}
c. {50, 60, 70, 80}
d. {20, 30, 40, 50, 60, 70, 80}

Correct Answer: c
Explanation: The detailed description can be found Week 2 Lecture material – Page no 65.

QUESTION 7:

What is the following sequence of steps taken in designing fuzzy logic system?

a. Fuzzification → Rule evaluation → Defuzzification
b. Fuzzification → Defuzzification → Rule evaluation
c. Rule evaluation → Fuzzification → Defuzzification
d. Rule evaluation → Defuzzification → Fuzzification

Correct Answer: a
Explanation: The detailed description can be found week 2 lecture material - Page No. 59.

QUESTION 8:

Which of the following is not a defuzzification method?

a. Weighted average method
b. Maxima method
c. Centroid method
d. Minima method

Correct Answer: d
Explanation: The detailed description can be found in Week 2 Lecture material –Page No. 61.

QUESTION 9:

Which of the following is the correct mathematical expression of COG method?

a. $\frac{\int x\mu_c(x)dx}{\int \mu_c(x)dx}$

b. $\frac{\sum_{i=1}^{c} x_i A_{c_i}}{\sum_{i=1}^{c} A_{c_i}}$

c. $\frac{\int x^2\mu_c(x)dx}{\int \mu_c(x)dx}$

d. None of the above

Correct Answer: a
Explanation: The detailed description can be found Week 2 Lecture material – Page no 98.

QUESTION 10:

If $x\ is\ A\ then\ y\ is\ B\ else\ y\ is\ C$, then the relation R is equivalent to

a. $(A \times B) + (B \times C)$
b. $(A \times B) \cup (\bar{A} \times C)$
c. $(A \times B) \rightarrow (B \times C)$

d. $(A \times C) \cup (B \times C)$

Correct Answer: b
Explanation: The detailed description can be found in Week 2 Lecture material (Zadeh's Max Min rule)-Slide no. 18, page number 33

QUESTION 11:

Which of the following defuzzification method is not a centroid method?

a. Centre of gravity method (COG)
b. Center of Mass (CoM)
c. Centre of sum method (COS)
d. Center of Area method (CoA)

Correct Answer: b
Explanation: The detailed description can be found week 2 lecture material - Page No. 79.

QUESTION 12:

Suppose a fuzzy set X is defined as {(10, 0.2), (15, 0.8), (20, 0.4), (25, 0.8), (30, 0.6)}. Which of the following Maxima defuzzification methods is not applicable to calculate the crisp value of X?

a. Last of maxima (LOM)
b. Mean of maxima (MOM)
c. First of Maxima (FOM)
d. Height method

Correct Answer: d
Explanation: Since the height is not unique, the height method cannot be applied here. The detailed description can be found in Week 2 Lecture material – Page no. 82

QUESTION 13:

$(\sim(P \wedge Q) \implies R) \wedge P \wedge Q$ is equivalent to

a. $(P \wedge Q)$
b. $(P \wedge Q) \vee R$
c. P
d. $(\sim P \vee Q)$

Correct Answer: a

Explanation: The detailed description can be found in Week 2 Lecture material– Fuzzy inferences.

P	Q	~ (P ⋀ Q)	~ (P ⋀ Q) ⟹R	R ⋀ P	R ⋀ P ⋀ Q
0	0	1	0	0	0
0	1	1	0	0	0
1	0	1	0	0	0
1	1	0	1	1	1

So, the final column represents (P ⋀ Q)

QUESTION 14:

If the output fuzzy set $C = C_1 \cup C_2 \cup \ldots\ldots\ldots C_n$, then the crisp value according to Centre of Sum (CoS) is defined as (Symbols have their usual meaning)

a. $x^* = \frac{\sum_{i=1}^{n} x_i.(A_i)}{\sum_{i=1}^{n} A_i}$

b. $x^* = \frac{\sum x_i.\mu_c(x_i)}{\sum \mu_c(x_i)}$

c. $x^* = \frac{\sum_{i=1}^{n} x_i A_{c_i}}{\sum_{i=1}^{n} A_{c_i}}$

d. $x^* = \frac{\sum_{i=1}^{n} \mu_{c_i}(x_i).x_i}{\sum_{i=1}^{n} \mu_{c_i}(x_i)}$

Correct Answer: c

Explanation: The detailed description can be found in defuzzification-II Lecture material, page number 94

QUESTION 15:

Which of the following defuzzification method is also known as “Sugeno defuzzification” method?

a. Centre of sum method (CoS)
b. Centre of gravity method (CoG)
c. Weighted average method
d. Centre of area method (CoA)

Correct Answer: c

Explanation: The detailed description can be found Week 2 Lecture material – Page no 100.

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