



18

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7th Sem B.Tech & B.Tech Dual Degree
CI CS-3030
(E&CSc, CSE, CSSE, CSCE)

AUTUMN END SEMESTER EXAMINATION-2019

7th Semester B.Tech & B.Tech Dual Degree

COMPUTATIONAL INTELLIGENCE

CS-3030

(For 2017 (L.E), 2016 & 2015 Admitted Batches)

Time: 3 Hours

Full Marks: 60

Answer any SIX questions.

Question paper consists of four sections-A, B, C, D.

Section A is compulsory.

Attempt minimum one question each from Sections B, C, D.

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable and all parts of a question should be answered at one place only.

1.

SECTION-A

[2 × 10]

- (a) Differentiate between supervised learning and unsupervised learning? What type of learning, perceptron belongs to?
- (b) Explain linguistic variable as a quintuple through an example.
- (c) How is modern AI (which uses soft computing techniques) different from traditional AI?
- (d) Give examples for one-point crossover and two-point crossover.
- (e) State the generalized DeMorgan's laws.
- (f) Explain alpha-cut and strong alpha-cut in a fuzzy set with a suitable example.
- (g) Explain elitism in GA with an example.
- (h) Explain the difference between probability and membership grade.

- (i) Give examples for discrete ordered and discrete non-ordered universes of discourse.
- (j) Differentiate between max-min composition and max-product composition with the same example.

SECTION-B

2. (a) Differentiate between soft computing & hard computing. Write at least ten characteristics of soft computing. Draw the schematic diagram of an expert system. [4]
- (b) Explain at least three types of soft computing techniques. Differentiate between composite and non-composite membership functions with suitable examples. [4]
- 3 (a) Explain through diagram how an artificial neuron is mapped with a biological neuron. Realize an two-input AND gate using single neuron perceptron. [4]
- (b) Give the diagrams and analytical expressions for eight activation functions normally used in ANN. [4]

SECTION-C

4. (a) Using Extension principle, obtain the mirror fuzzy set B on Y for following fuzzy set A on X: [4]
 $A = 0.2/-3 + 0.5/-2 + 0.8/-1 + 1.0/0 + 0.7/1 + 0.4/2 + 0.2/1$
 given the mapping function as $y = f(x) = x^2 - 3x + 2$ where x belongs to X and y belongs to Y.
- (a) Explain through diagram Mamdani fuzzy inference system. Explain five defuzzification strategies normally used in this FIS. [4]
5. (a) Explain the characteristics of derivative free optimization. In GA what is the role of crossover, mutation and selection. Write the steps of GA. [4]

- (b) Write the limitation of single layer perceptron. Explain through XOR example how a multi-layer perceptron can overcome this limitation. [4]

6. The fuzzy sets for a transistor and a resistor are given below: [8]

$$U_T = 0/0 + 0.2/1 + 0.7/2 + 0.8/3 + 0.9/4 + 1/5$$

$$U_R = 0/0 + 0.1/1 + 0.3/2 + 0.2/3 + 0.4/4 + 0.5/5$$

Obtain the following between the above two sets:

- (a) Algebraic sum
- (b) Algebraic product
- (c) Bounded sum
- (d) Bounded product

Also obtain the Sugeno's complement of U_T and Yager's complement of U_R . (assume Sugeno parameter s as 0 and Yager parameter w as 1).

SECTION-D

7. (a) Explain a radial basis function network (RBFN) architecture through a diagram. What are its learning methods? [4]
- (b) Explain Adaptive Neuro-Fuzzy Inference System (ANFIS) architecture through a diagram. [4]
8. (a) Compare and contrast between Sugeno fuzzy model and Tsukamoto fuzzy model. Explain these models through diagrams using the rule statements in each case. [4]
- (b) Explain the principle of operation of back propagation MLP. State back propagation learning rules. [4]
