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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
07 THRISSUR CLUSTER

SECOND SEMESTER M.TECH. DEGREE EXAMINATION APRIL 2018

Computer Science and Engineering

Computer Science and Engineering

07CS6120 SOFTCOMPUTING

Time : 3 hours

Max.Marks: 60

Answer all six questions. Part 'a' of each question is compulsory.

Answer either part 'b' or part 'c' of each question

Q.no. **Module 1** **Marks**
1a Explain the various Softcomputing constituents. **4**

Answer b or c

b Explain the architecture of back propagation network. Why sigmoidal activations are used in BPN? Why is it advantageous over step function? **5**

c **5**

Number of sides=3	Equal sides	Equilateral triangle
false	false	false
false	true	false
true	false	false
true	true	true

Implement the above table with appropriate logic function using any neural network model

Q.no. **Module 2** **Marks**
2a Why a single layer perception cannot simulate a simple exclusive-or function. Explain. **4**

Answer b or c

b Suppose that a single neuron with two input nodes x_1 and x_2 is given, and the neuron's activation function is the threshold function: $f(s) = 0$ if $s \leq 1$ and $f(s) = 1$ if $s > 1$. Assume that s is the net input. Train this single node network with the perceptron learning algorithm using: initial weight vector $w=(1.5, 0.5)$, learning rate $\eta=0.5$, and the following examples: **5**

Input		Output
X1	X2	
0	0	0
0	1	1
1	0	1
1	1	1

c Draw the architecture and explain the algorithm of Kohonen Self Organizing Maps.

5

Q.no. **Module 3** **Marks**

3a Why membership functions are used in Fuzzy logic? Give examples?

4

Answer b or c

b The task is to recognize English alphabetical characters (F,E,X,Y,I,T) in an image processing system. Two fuzzy sets I and F to represent the identification of characters I and F are defined as:

5

$$I = \{(F, 0.4), (E, 0.3), (X, 0.1), (Y, 0.1), (I, 0.9), (T, 0.8)\}$$

$$F = \{(F, 0.99), (E, 0.8), (X, 0.1), (Y, 0.2), (I, 0.5), (T, 0.5)\}$$

Find the following.

i) $I \cup F$ ii) $I - F$ iii) $F \cup F^c$ iv) Verify Demorgan's Law, $(I \cup F)^c = I^c \cap F^c$

c Consider a set $P = \{P1, P2, P3, P4\}$ of four varieties of paddy plants, set $D = \{D1, D2, D3, D4\}$ of the various diseases affecting the plants and $S = \{S1, S2, S3, S4\}$ be the common symptoms of the diseases. Let R be a relation on $P \times D$ and S be a relation on $D \times S$.

5

		D1	D2	D3	D4			S1	S2	S3	S4
R=	P1	0.6	0.6	0.9	0.8		D1	0.1	0.2	0.7	0.9
	P2	0.1	0.2	0.9	0.8		D2	1	1	0.4	0.6
	P3	0.9	0.3	0.4	0.8	S=	D3	0	0	0.5	0.9
	P4	0.9	0.8	0.1	0.2		D4	0.9	1	0.8	0.2

Obtain the association of the plants with the different symptoms of the diseases using max –min composition.

Module 4

Marks

Q.no.

4a

4

Consider the following real variables from everyday life:

- Income measured in INR
- Speed measured in meters per second.
- A TV show measured in how much you are interested watching it.
- A meal measured in how much you like to eat it.
- A traffic light measured in what colour is on.

In each case, suggest fuzzy linguistic variables corresponding to these real variables. For which of these five variables the use of a fuzzy linguistic variable is not really necessary? Why?

Answer b or c

- | | | |
|----------|---|----------|
| b | Model a two input single output Mamdani fuzzy inference system. Also differentiate between Mamdani and Sugeno Fuzzy models. | 5 |
| c | Explain how fuzzy logic can be used to design automatic washing machine. | 5 |

Q.no.	Module 5	Marks
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| 5a | What is ACO meta-heuristics ? | 5 |
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Answer b or c

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|----------|---|----------|
| b | Solve the Multiple Knapsack problem using Ant Colony Optimisation. | 7 |
| c | A set of $i \in I$, jobs need to be assigned to a set of $j \in J$ agents. Elaborate the method for this assignment using ACO. | 7 |

Q.no.	Module 6	Marks
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|-----------|---|----------|
| 6a | Explain Genetic Algorithm Cycle with example. | 5 |
|-----------|---|----------|

Answer b or c

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|----------|---|----------|
| b | Elaborate the method of Reproduction? Give various methods of selecting chromosomes for parents to cross over. | 7 |
| c | A tourist has to follow the shortest route to visit N cities exactly once and reach the starting city. Apply genetic algorithm to solve this problem. | 7 |