Name: **Enrolment No:**	

UPES
End Semester Examination, May 2023

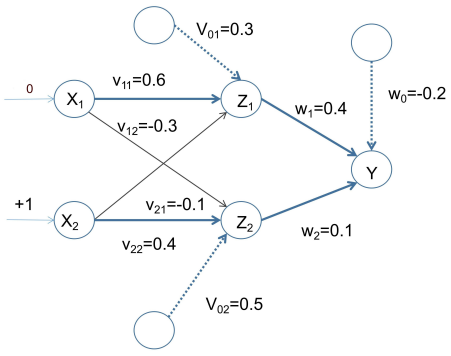
Course : MCA **Semester : 2**
Program : Soft Computing **Time : 03 hrs.**
Course Code : CSAI 7013P **Max. Marks: 100**

Instructions: Attempt all the questions.

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Compare between the hard computing and soft computing.	**4**	**CO1**
Q 2	Discuss the current trends in soft computing in brief.	**4**	**CO1**
Q 3	Justify why XOR is non-linear and AND and OR gates are linearly separable.	**4**	**CO2**
Q 4	Differentiate between auto, hetero, and bidirectional associative memories.	**4**	**CO3**
Q 5	List down at least four major applications of genetic algorithm with a brief description of each of them.	**4**	**CO5**

SECTION B
(4Qx10M= 40 Marks)

Q 6	Discuss the various ANN architectures with appropriate block diagrams.	**10**	**CO2**
Q 7	Use Madaline network to train XOR function with bipolar inputs and targets. Perform at least 2 epochs of training. Include all the necessary metrics like inputs, expected and observed outputs, change in weights and bias, updated weights, and errors explicitly in the tabular simulation. Assume all the parameters required for training the network on your own.	**10**	**CO3**
Q 8	Find the new weights, using back-propagation network for the following network. The network is presented with the input pattern [0, 1] and the target output is 1. Use a learning rate α = 0.25 and binary sigmoidal activation function. 	**10**	**CO3**

<table>
<tr>
<td>Q 9</td>
<td>Train the autoassociative network for the patterns- {(1 1 - 1 1), (-1 -1 1 1), (1 1 1 -1), (-1 -1 -1 1)} and test the same for the patterns- (1 1 1 1) and (-1 -1 0 1).
OR
Construct a discrete bidirectional associative memory for the following pattern classification. Test the constructed network for the pattern- (1 0 10 0 0 1 0). Assume all the necessary training parameter on your own.
<table>
<tr><th>X1</th><th>X2</th><th>X3</th><th>X4</th><th>X5</th><th>X6</th><th>X7</th><th>T1</th><th>T2</th><th>T3</th></tr>
<tr><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td></tr>
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<td>10</td>
<td>CO3</td>
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<tr>
<td colspan="4">SECTION-C
(2Qx20M=40 Marks)</td>
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<tr>
<td>Q 10</td>
<td>Consider a universe of aircraft speed near the speed of sound as X = {0.72, 0.725, 0.75, 0.775, 0.78} and a fuzzy set on this universe for the speed “near mach 0.75”= $\widetilde{M}$,where
$$\tilde{M} = \frac{0}{0.72} + \frac{0.8}{0.725} + \frac{1}{0.75} + \frac{0.8}{0.775} + \frac{0}{0.78}$$
Define a universe of altitude as Y = {21, 22, 23, 24, 25, 26, 27} in k-feet and a fuzzy set on this universe for the altitude fuzzy set “approximately 24000 feet” = $\widetilde{N}$, where
$$\tilde{N} = \frac{0}{21k} + \frac{0.2}{22k} + \frac{0.7}{23k} + \frac{1}{24k} + \frac{0.7}{25k} + \frac{0.2}{26k} + \frac{0}{27k}$$
(a) Construct a relation $\widetilde{R} = \widetilde{M} \times \widetilde{N}$
(b) For another aircraft speed, say $\widetilde{M_1}$, in the region of mach 0.75 where
$$\tilde{M}_1 = \frac{0}{0.72} + \frac{0.8}{0.725} + \frac{1}{0.75} + \frac{0.6}{0.775} + \frac{0}{0.78}$$
Find relation $\widetilde{S} = \widetilde{M_1} \circ \widetilde{R}$
(i) Using max-min composition
(ii) Using max-product composition</td>
<td>20 (5 + 7.5 + 7.5)</td>
<td>CO4</td>
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<tr>
<td>Q 11</td>
<td>Write short notes on any four of the following:
(a) Crossover and its type in Genetic Algorithm
(b) Fitness proportionate selection in Genetic Algorithm
(c) Mutation in Genetic Algorithm
(d) Genetic Algorithm
(e) Particle Swarm Optimization
(f) Differential Evolution
(g) Teaching Learning Based Optimization</td>
<td>20</td>
<td>CO5</td>
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