B.TECH/CSE/8TH SEM/CSEN 4263/2019 SOFT COMPUTING (CSEN 4263)

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A (Multiple Choice Type Questions)

- $10 \times 1 = 10$ 1. Choose the correct alternative for the following:
 - (i) Which of the following neural networks uses supervised learning? (a) Bi-directional associative memory (b) Perceptron learning network (c) Self-organizing feature map (d) Hopfield network.
 - (ii) Which of the following function is differentiable?
 - (a) Bipolar sigmoid function (b) Unit step function (c) Threshold function (d) Hard limit function.
 - (iii) The roulette wheel is a technique used for
 - (a) selecting the most relevant chromosome pair
 - (b) randomly selecting the chromosomes
 - (c) crossing-over the selected chromosomes
 - (d) measuring the fitness of the chromosomes.
 - Linearly separable problems are interesting in neural network, because of (iv) the fact
 - (a) clustering can be done very easily
 - (b) numbers of hidden layers are very less
 - (c) polynomial curve can be realized to separate cluster
 - (d) hyper planes are easily to realize.
 - Which of the following functions cannot be resolved by single perceptron (v) model?
 - (a) AND (b) OR (c) XOR (d) none of these.
 - One self-organizing feature map (SOFM) has 15 input units, and 100 output (vi) units arranged in a two-dimensional grid. How many weights does this network have? (a) 100 (b) 800(c) 1000 (d) 1500.

B.TECH/CSE/8TH SEM/CSEN 4263/2019

- (vii) What is back propagation in ANN?
 - (a) It is another name given to the curvy function in the perceptron.
 - (b) It is the transmission of error back through the network to adjust the inputs.
 - (c) It is the transmission of error back through the network to allow weights to be adjusted so that the network can learn.

(d) It is a feed forward technique.

- Which of the following term is not related with artificial neural network? (viii) (a) MOGA (b) Transfer function (c) Synaptic weights (d) Back propagation.
- A 4-input neuron has weights 1, 1, 1.5 and 1.5. The transfer function is linear (ix) and learning rate being equal to 1. The inputs are 8, 10, 2 and 20 respectively. The output will be: (a) 51 (b) 76 (c) 60 (d) 52.
- Which of the following problems is solvable in polynomial time complexity? (x) (b) Graph coloring
 - (a) Travelling salesman problem
 - (c) Homogeneous bin packing problem (d) Minimum spanning tree.

Group – B

- 2. (a) Justify the "Soft Computing" approach in solving classification problem using artificial neural network.
 - Explain with example the difference between fuzzy set and crisp set. (b)
 - (c) Consider two given fuzzy sets A and B are: $A = \{ 1/p + 0.3/q + 0.5/r + 0.2/s \}$ B= { 0.5/p + 0.4/q + 0.1/r + 1/s } Perform union, intersection and complement operations over fuzzy sets A and B.

 $3 + 3 + (3 \times 2) = 12$

- 3. (a) Write the benefits of fuzzy logic.
- (b) Let the universe of inters, $U = \{1, 2, 3, 4, 5\}$. The primary linguistic terms are 'Cold' and 'Hot' are follows : 'Cold'= $\{ 1/1 + 0.8/2 + 0.6/3 + 0.4/4 + 0.2/5 \}$ 'Hot' = $\{0.2/1 + 0.4/2 + 0.6/3 + 0.8/4 + 1/5\}$ Find the linguistic-modified fuzzy sets for 'Very Cold', 'Not Very Hot', and 'Not Very Cold And Not Very Hot'.
- From the age set of {0, 100} years, develop suitable fuzzy membership (c) function for young people.

3 + 6 + 3 = 12

1

Group – C

- 4. (a) Design an artificial neural network for the XOR function, $x_1 \oplus x_2$. Clearly define the integration function and activation function.
- (b) Find a weight vector w to realize the output.

4 + 8 = 12

5. (a) Consider the following 1-dimensional points together with their class labels: Class I: $x_1 = 0.5$, $x_2 = 1.5$ and $d^{(1)} = d^{(2)} = +1$; Class II $x_3 = 0.5$, $x_4 = -2$ and $d^{(3)} = d^{(4)} = -1$.

Find the weight vector after four epochs using simple perceptron learning rule. Assume learning constant, $\eta=0.5$ and initial weight vector, $w = [-2, 1.5]^{T}$.

(b) Explain adaptive resonance theory with proper diagram.

8 + 4 = 12

Group – D

- 6. (a) Define multi objective optimization using pareto-model with some suitable example.
- (b) Explain the procedure of NSG algorithm.
- (c) Consider the following table. We have to optimize time as well as cost.

Flight	Travel Time	Price
	(hr)	(\$)
А	10	1700
В	9	2000
С	8	1800
D	7.5	2300
Е	6	2200

3+ 5+ 4 = 12

Suppose we have the problem of "Bin Packing" and maximum capacity of each bin is 10. Now, consider 10 objects with the following weights:
5, 2, 7, 3, 5, 6, 8, 4, 4, 7.

Define **chromosomes**, **fitness function**, **cross over and mutation** in solving this problem using genetic algorithms.

Group – E

8. Consider a TSP problem with complete graph G(V,E), where |V|=6 and consider any integer as the weight w_{ij} for an edge (i,j) of this graph G(V,E). Apply Particle Swarm Optimization (PSO) to solve the problem.

9. Write short notes on the following concepts:

- (i) Neuro- Fuzzy System.
- (ii) Bee Colony Optimization.

2 × 6=12

12

12