Registration No: | | | | | | | | | | |

Total Number of Pages: 2 **M.TECH**

P1PGCC01

1st Semester Regular/ Back Examination 2016-17
COMPUTATIONAL METHODS AND TECHNIQUES
BRANCH: ALL BRANCHES & ALL SPECILIZATIONS
Time: 3 Hours
Max Marks: 100
Q.CODE:Y884

Answer Question No.1 which is compulsory and any FOUR from the rest.
The figures in the right hand margin indicate marks.

Q1 Answer the following questions: ***Short answer type*** **(2 x 10)**

a) Why an activation function is used in ANN? List the various activation functions used in ANN.

b) Enumerate the demerits of back propagation algorithm.

c) What is encoding in GA?

d) Differentiate between fuzzy-neural hybrid and fuzzy-genetic hybrid system.

e) Justify the following statement
"Partial membership is allowed in fuzzy sets".

f) Enumerate the various selection procedures in Genetic Algorithm.

g) What do you mean by optimization? What are the necessary condition and sufficient condition to find out optimum of a single variable function?

h) What do you mean by r^{th} differential of an n- variable function? What is a saddle point?

i) If A'={(X1,0.3),(X2,0.7),(X3,0.8)}
B'={(X1,0.3),(X2,0.2),(X3,0.6)}
Find A'-B'

j) Explain Newton's method of optimization with example.

Q2 **a)** Describe briefly Biological neural Network and McCulloch-Pitts Model. What is ADALINE and MADALINE? **(10)**

b) What is Learning of ANN? What are the different types of learning methods used? Describe Delta Learning Rule with an example how to update the weight matrix. **(10)**

Q3 **a)** (i). What is crossover operator? Discuss different types of crossover operators with example in each case. **(15)**
(ii). What is mutation operator? Discuss different types of mutation operators with example in each case.

b) What do you understand by 'Tournament Selection' with reference to GA? How does it overcome the demerits of roulette wheel selection? **(5)**

Q4 **a)** What is Fuzzy Inference System (FIS)? With block diagram, explain the working principle of an FIS. Differentiate between Mamdani and Sugeno FIS. **(10)**

b) What is Defuzzification? Explain different types of Defuzzification methods with example. **(10)**

Q5 **a)** Solve the following linear programming problem by using the simplex method(Big M method) **(10)**

Min $Z = 2X_1 + 3X_2$

Subject to:

$$\frac{1}{2}X_1 + \frac{1}{4}X_2 \leq 4$$

$$X_1 + 3X_2 \geq 20$$

$$X_1 + X_2 = 10$$

$$X_1, X_2 \geq 0$$

b) 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. Here R be a relation on P×D and S be a relation on D×S. **(10)**

For R= $\begin{bmatrix} 01 & 05 & 0.4 & 0.6 \\ 0 & 0.1 & 0.3 & 0.2 \\ 1 & 0.9 & 0.7 & 0.6 \\ 0.5 & 0.4 & 0.3 & 0.2 \end{bmatrix}$ S= $\begin{bmatrix} 0.9 & 0.7 & 1 & 0.4 \\ 0.3 & 0.6 & 0.8 & 0.7 \\ 0 & 0.5 & 0.5 & 0.7 \\ 1 & 0.4 & 0.2 & 0.1 \end{bmatrix}$

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

Q6 **a)** Maximize the following function for one generation and infer its average fitness compared to the previous generation as. $f(x)=y=x^2+2x$, subject to $0.5 \leq x \leq 1.0$ with the following initial solutions of population: **(10)**

1.11001110011
2.10001111101
3.10111100011
4.10000001110
5.10101000010
6.11100000010

Consider single point crossovers at bit position '6' and 'nil' mutation.

b) Find the dimensions of a cylindrical tin(with top and bottom) made up of sheet metal to maximize its volume such that the total surface area is equal to $A_0 = 24\pi$. **(10)**

Q7 **a)** Explain the 'back propagation' algorithm in a feedforward neural network with one hidden layer. Derive the relevant expressions. **(10)**
What do you mean by an 'epoch'?

b) Write short notes on any two: **(10)**

(i)Particle swarm optimization
(ii)Dynamic Programming method
(iii)Finite Element based Optimization
(iv)Lagrange Multiplier Method for optimization
(v)Kohonen's Feature Map