Student Exam No._____

GANPAT UNIVERSITY

B. Tech. Semester: 8th (VIIIth) (Mechatronics) Engineering

Regular Examination April – June 2016

Computational Intelligence Techniques 2MC801

Time: 3 Hours **Total Marks: 70**

Instruction: 1 **Figures** to the **right** indicate **full marks.**
2 **Right each section in separate answer book.**
3 **Give precise** and **to the point answer.**
4 **Neat** and **Clean** work is **mandatory.**

Section - I

Que. – 1 Attempt all questions

(a) Define optimization and formulate its components. Classify types of constraints with example. (4)

(b) A 2 feet piece of wire is cut into two pieces and once piece is bent into a square and the other is bent into an equilateral triangle. Where should the wire cut so that the total area enclosed by both is minimum and maximum? (4)

(c) Company want to construct a box with a square base and it has only have 10 m^2 of material to use in construction of the box. Assuming that all the material is used in the construction process determine the maximum volume that the box can have. (4)

OR

Que. – 1 (a) Giving an example prove limitation of single variable differential method for optimization. (4)

(b) A right circular cone having 8 cm height and 4cm radius find out the maximum volume of a cylinder that can inscribe in cone. (4)

(c) Two poles, one 6 meters tall and one 15 meters tall, are 20 meters apart. A length of wire is attached to the top of each pole and it is also staked to the ground somewhere between the two poles. Where the wire should be staked so that the minimum amount of wire is used? (4)

Que. – 2 Attempt all questions

(a) Apply the KUHN- TUCKER condition find the value of β for which the point $x_1^*=1$, $x_2^*=2$ will be optimal to the following problem. (6)

Maximize : $f(x_1,x_2)= 2x_1+ \beta x_2$

$g_1(x_1,x_2)=x_1^2+x_2-5\leq 0$

$g_2(x_1,x_2)=x_1-x_2+1\leq 0$

(b) Minimize $f(x)=(1/2)(x_1^2+x_2^2+x_3^2)$ (5)

$g_1(x)= x_1-x_2=0$

$g_2(x)=x_1+x_2+x_3-1$

Using LANGRANGE multiplier method.

OR

Que. – 2 (a) Using KUHN- TUCKER method maximize (6)

$f(x)= 8x_1^2+2x_2^2$

Subject to constraint $x_1^2+x_2^2\leq 9$

$x_1\leq 2$

$x_1, x_2 \geq 0$

(b) A beam of uniform Rectangular cross section is to be cut from is to be cut from a log having circular section of radius r. The beam is to be used as a cantilever of fixed length to carry a concentrated load at its free end. Determine the dimensions of the beam that correspond to the maximum tensile stress capacity also, find the maximum stress capacity. Solve by using the LAGRANGIAN MULTIPLIER method. (5)

Que. – 3 Attempt any three (12)

(a) A publisher wishes to maximize the printed area on page of area 5 sq.cm, leaving margins as 3 cm at top and 2 cm on other three side of the page. Determine the dimensions of the page using CONSTRAINTS VARIATION method

(b) Minimize heat transfer rate for function $Q=\sigma hA$ using GENETIC ALGORITHM upto 2 iterations. where $h=2+\frac{0.5\sigma^{0.2}}{D}$, $D\sigma=20$ and $A=c/s$ *area* limit is 0<D<6.3, maximum value of Q should not go beyond 800 *Kw*.

(c) What is convex and concave objective function? What is point, line, and hyper plane's equations in optimization?

(d) Define mutation, crossover, chromosome and string in Genetic Algorithm with example.

Section – II

Que. – 4 Attempt all questions (12)

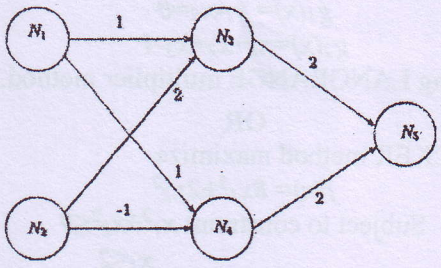
(a) Explain characteristics and tenability for activation function. Discuss logsig and tanh activation functions.

(b) Using the Hebb rule, find the weights required to perform the classifications given in the table. Take threshold value 0 with all initial weights and bias as 0. Consider ($\Delta w_i = x_i y$ *and* $\Delta b = y$)

X_1	X_2	X_3	b	y
1	1	1	1	1
1	1	-1	1	-1
-1	1	-1	1	1
1	-1	1	1	-1

OR

Que. – 4 (a) Consider the neural network of McCulloch-Pitts neuron shown in figure. Each neuron has a threshold of except input neuron N_1 *and* N_2. Define the response of neuron N_5 at time t in terms of the input neurons, N_1 *and* N_2 at the appropriate time for given table.



N_1	N_2
1	1
1	0
0	1
0	0

(b) Discuss Boltzmann learning for neural network.

Que. – 5 Attempt all questions

(a) Give a fuzzy set $A = \left\{\frac{0.4}{1}, \frac{0.1}{-1}, \frac{0.3}{2}, \frac{0.2}{3}, \frac{0.3}{-3}\right\}$ and function $f(x) = 2x^2$ determine the fuzzy set $B = f(A)$ by using the extension principle. (6)

(b) Define membership function, explain it with suitable example and give three possible ways to represent fuzzy sets. (5)

OR

Que. – 5 (a) Let $X = \{1 \quad 2 \quad 3 \quad 4 \quad 5\}$ and $Y = \{1 \quad 2 \quad 3\}$ if the membership associated with each ordered pair $(x, \ y)$ is given by $\mu_R = \frac{1}{x+y}$ and $\mu_s = e^{-(x+y)}$ Then derive the fuzzy relation ship $R(x, \ y)$ and $S(x, \ y)$. (6)

(b) Draw the shape and give mathematical expression for following membership functions. (5)

1. Trapezoidal function
2. Triangular function
3. S curve function

Que. – 6 Attempt all questions (12)

(a) Find $T = RoS$, using max-product composition criteria for given R and S.

$$R = \begin{bmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \\ 1 & 1 & 0 & 0 \end{bmatrix} \text{ and } S = \begin{bmatrix} 1 & 0 \\ 1 & 0 \\ 0 & 1 \\ 0 & 0 \end{bmatrix}.$$

(b) Discuss biological neural network.

(c) Give the flowchart for functionality of genetic programming

END OF PAPER