Student Exam No.

Date: 12/05

GANPAT UNIVERSITY

B. Tech. Semester: VIII MechatronicsEngineering

Regular Examination April - June 2015

2MC801 Computational Intelligence Techniques

Total Marks: 70

Time: 3 Hours

Instruction:
1 Start a new question from new page.
2 Draw the figure with right indication.
3 Answer to the two sections must be written in separate answer sheet.
4 Assume necessary data and mention your assumption.

Section - I

Que. – 1 [12]

(a) Discuss objective function and objective function surface. (06)

(b) Using direct substitutionmethod, find the dimensions of a box of largest volume that can be inscribedin a sphere of unit radius. (06)

OR

Que. – 1 [12]

(a) Find the extreme points of the function (06)

$$f(x_1 \quad x_2) = x_1^3 + x_2^3 + 2x_1^2 + 4x_2^2 + 6$$

(b) An electric light is placed directly over the centre of a circular plot of lawn 100 m in diameter. Assuming that the intensity of light varies directly as the sine of the angle at which it strikes an illuminated surface, and inversely as the square of its distance from the surface, how high should the light be hung in order that the intensity may be as great as possible at the circumference of the plot? (06)

Que. – 2 [11]

There are two different sites, each with four possible targets (or depths) to drill an oil well. The preparation cost for each site and the cost of drilling at site i to target j are given below:

	Drilling Cost to target j				
Site i	1	2	3	4	Preparation Cost
1	4	1	9	7	11
2	7	9	5	2	13

Formulate the problem of determining the best site for each target so that the total cost is minimized.

OR

Que. – 2 [11]

(a) Find the values of x, y and z that maximize the function (05)

$$f(x, \quad y, \quad z) = \frac{6xyz}{x + 2y + 2z}$$

When x, y and z are restricted by the relation $xyz = 16$

(b) Use Lagrange Multiplier method to (06)

$$Minimize \quad f(X) = \frac{1}{2}(x_1^2 + x_2^2 + x_3^2)$$

$$Subject\ to \quad g_1(X) = x_1 - x_2 = 0$$

$$g_2(X) = x_1 + x_2 + x_3 - 1 = 0$$

Que. – 3 Do as directed [12]

(a) Use Kuhn–Tucker conditions to (04)

$$Minimize\ f = x_1^2 + 2x_2^2 + 3x_3^2$$

$$Subject\ to\ Constraints \quad g_1 = x_1 - x_2 - 2x_3 \leq 12$$

$$g_2 = x_1 + 2x_2 - 3x_3 \leq 8$$

(b) Define a saddle point and indicate its significance. (04)

(c) Find following quadratic forms is positive definite, negative definite, or neither (04)

1. $f = -x_1^2 + 4x_1x_2 + 4x_2^2$
2. $f = x_1^2 + 4x_2^2$

Section – II

Que. – 4 [12]

(a) Discuss error correction learning and Memory based Learning (06)

(b) Discuss competitive learning with geometrical interpretation. (06)

OR

Que. – 4 [12]

(a) Discuss biological basic neuron cell how it is analogous to ANN. (06)

(b) Discuss linear and nonlinear ANN model, also discuss 3D error plot. (06)

Que. – 5 [11]

Let X be a universe of general, well-known objects, such as

$$X = \{car, boat, house, bike, tree, mountain\}$$

and let Y be a universe of simple geometric shapes, such as

$$Y = \{suare, octagoan, triangle, circle, ellipse\}$$

Define a simple fuzzy sets of objects, such as 'car', 'square' and 'corner' as given below:

$$A = car = \left\{\frac{1.0}{car} \quad \frac{0.4}{boat} \quad \frac{0.1}{house} \quad \frac{0.6}{bike} \quad \frac{0.1}{tree} \quad \frac{0}{mountain}\right\}$$

$$B = square = \left\{\frac{1.0}{square} \quad \frac{0.5}{octagoan} \quad \frac{0.4}{triangle} \quad \frac{0}{circle} \quad \frac{0.1}{ellipse}\right\}$$

$$C = corner = \left\{\frac{0.6}{square} \quad \frac{0.9}{octagoan} \quad \frac{0.4}{triangle} \quad \frac{0}{circle} \quad \frac{0.2}{ellipse}\right\}$$

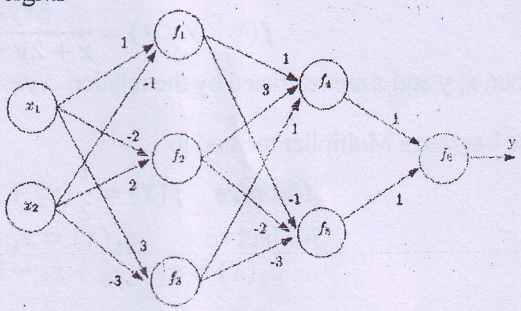
1. Find a relation R between 'car' and 'square'.
2. Find a relation S between 'square' and 'corner'.
3. Using max-min composition rule find a relation T between 'car' and 'corner'.

OR

Que. – 5 [11]

Consider ANN in given figure let inputs $x_1 = 1;\ x_2 = 1\ and\ y = 0$ for this patterntake activation function $f_i(v) = log(v)$, where $v = \sum_{j=1}^{n} x_j w_{kj}$ let learning rule $\Delta w_{kj} = 0.3 y_{(j-1)} y_j$

1. Make one feed forward iteration
2. Do back propagation, find the error for all hidden layers and output layer
3. Update all weights



[12]

Que. – 6 Do as directed

(a) Consider fuzzy sets $X = \{1 \quad 2 \quad 3\}; Y = \{1 \quad 2 \quad 3 \quad 4\}$ *and* $Z = \{1 \quad 2\}$ derive the relations $\mu_R(x \quad y) = e^{-(x+y)}$ *and* $\mu_S(y \quad z) = e^{-(x-y)}$ using max-min composition and find $T = R \circ S$. **(04)**

(b) Define fuzzy membership function, with appropriate example **(04)**

(c) Introduce genetic Algorithm **(04)**

END OF PAPER