

Motilal Nehru National Institute of Technology Allahabad

Department of Computer Science & Engineering

MCA Third Semester, Ph.D

End Semester Examination 2016

Subject Code/Name: CA3303/Soft Computing

Duration: 3 Hours

Maximum Marks: 60

Note: Be brief while answering the questions. Answer all parts of question in continuous pages.
Write your assumptions before answering any question with missing data (*if you find one*).

Good Luck.

- Q1. a) Give the classification tree of optimization techniques. (2 Marks)
b) Give the working principle of Genetic Algorithms. (2 Marks)
c) What two requirements should a problem satisfy in order to be suitable for solving it by a GA? (2 Marks)
b) Draw following activation functions of a neuron (2 Marks)
Step function, Signum function, Sigmoid function, and Linear function

- Q2. a) Can a fuzzy membership be True and False at the same time? Answer with suitable example. (2 Marks)
b) Write down the meaning of the membership degree for a fuzzy set. (2 Marks)
c) Design networks using M-P neurons for 3-input NOR and NAND logic gates. (2 Marks)
d) Give two examples of pattern recognition tasks to illustrate the superiority of the biological neural network over a conventional computer system. (2 Marks)

Q3. Show that if A and B are sets, then

- a) $B - A = B \cap A'$. (2 Marks)
b) $(A \cap B) \cup (A \cap B) = A$. (2 Marks)
c) Let A and B be subsets of a universal set U . Show that $A \subseteq B$ if and only if $B' \subseteq A'$. (2 Marks)

- Q4. a) Suppose that $A \times B = \emptyset$ where A and B are sets. What can you conclude? (2 Marks)
b) Use a Venn diagram to illustrate the set of all months of the year whose names do not contain the letter R in the set of all months of the year. (2 Marks)
c) List at least four applications of Genetic Algorithms. (2 Marks)
d) Consider a fuzzy set Age as defined below
 $\text{Age} = \{(20,0), (30,0.2), (40,0.4), (50,0.6), (60,0.8), (70,1), (80,1)\}$. Give the alpha cut for $\alpha=0.4$ for the set Age. (2 Marks)

P.T.O.

Q 5. a) Define the terms chromosome, fitness function, crossover and mutation as used in genetic algorithms. (2 Marks)

b) Give the predicate logic statements for the following (4 Marks)

- i) Ram likes all kinds of food.
- ii) Sita likes anything which Ram likes.
- iii) Raj likes those which Sita and Ram both like.
- iv) Ali likes some of which Ram likes.

Q 6. Consider the following real variables from everyday life: (6 Marks)

- Income measured in ₹
- Speed measured in meters per second.
- A TV show measured in how much you are interested watching it.
- A meal measured in how much you like to eat it.
- A traffic light measured in what colour is on.

In each case, suggest a fuzzy variable corresponding to these real variables.

For which of these five variables the use of a fuzzy variable is not really necessary? Why?

Q 7. a) Define following operations on fuzzy sets suitable example (8 Marks)

Product of two fuzzy sets, equality of fuzzy sets, product of a fuzzy set with a crisp no, and power of a fuzzy set.

b) Find the sets A and B if $A - B = \{1, 5, 7, 8\}$, $B - A = \{2, 10\}$, and $A \cap B = \{3, 6, 9\}$. (2 Marks)

Q 8. a) Write an iterative method (algorithm) to find the intersection and union of two given fuzzy sets. (4 Marks)

b) What is an optimization problem? How a minimization problem can be converted to a maximization problem, explain with an example. (4 Marks)

End of question paper.