GURU NANAK INSTITUTE OF TECHNOLOGY

An Autonomous Institute under MAKAUT

2020-2021

COMPUTATIONAL INTELLIGENCE

MCAE503A

TIME ALLOTTED: 3 Hrs **FULL MARKS: 70**

The figures in the margin indicate full marks.

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

GROUP – A

(Multiple Choice Type Questions)

Answer any ***ten*** from the following, choosing the correct alternative of each question: **10×1=10**

		Marks	CO No
1(i)	Which of the following is not a partitioning clustering method? a) K-means b) Self-organising Map c) Iso-data d) None of these	01	CO4
1(ii)	According to Modus Ponens inference rule, from P and P ->Q infer a) P b) Q c) $\overline{P}$ d) $\overline{Q}$	01	CO2
1(iii)	If in a problem the number of initial states is much more than the goal states, we should use a) Forward Reasoning b) Backward Reasoning c) Both of them d) None of these	01	CO2
1(iv)	Which of the two will perform better when the training set is small? a) PCA b) LDA c) Both of these d) None of these	01	CO3
1(v)	A Bayesian network is a a) Tree b) Directed graph c) Non-directed graph d) None of these	01	CO2
1(vi)	In genetic algorithms, term ‘gene’ is defined as a) Coded design vector b) Coded design variable c) Every bit d) None of these	01	CO5

1(vii)	The boundary of the fuzzy set A is defined by those elements x of the universe such that a) $\mu_{A(x)} = 1$ b) $\mu_{A(x)} = 0$ c) $0 < \mu_{A(x)} < 1$ d) $0 \leq \mu_{A(x)} \leq 1$	01	CO2
1 (viii)	Which AI system mimics the structure and functioning of the human brain? a) Expert System b) Decision Support System c) Neural Network d) Genetic Algorithm	01	CO3
1(ix)	In ……. Mode of learning, all neurons in Hopfield networks fire at random. a) Stable status b) Output c) Synchronous d) Asynchronous	01	CO4
1(x)	Inheritable knowledge is best represented by a) Semantic net b) FOL c) Database d) None of these	01	CO4
1(xi)	Artificial neural network is based on the concept of a) Gradient descent technique b) Biological neuron technique c) Random descent technique d) Both (a) and (b)	01	CO4
1(xii)	K-means clustering supports which of the following learning? a) Supervised learning b) Unsupervised learning c) Formal learning d) None of these	01	CO4
1(xiii)	Which of the following operators use holes during crossover? a) Partially matched crossover b) Cycle crossover c) Order crossover d) All of these	01	CO5
1(xiv)	Strings in genetic algorithms are analogous to which of the following in biological systems ? a) Chromosomes b) Genotypes c) Allele d) None of these	01	CO5

1(xv)	Fuzzy set theory was introduced by a) Zadeh b) Rosenblatt c) Minsky d) Glover.	01	CO2

GROUP – B
(Short Answer Type Questions)

(Answer any *three* of the following) **3 x 5 = 15**

		Marks	CO No
2. a)	What do you mean by Computational learning theory?	01	CO1
2. b)	How fuzzy sets and Approximate reasoning learning are related?	02	CO2
2.c)	What is the difference between α-cuts and strong α-cuts in fuzzy set theory?	02	CO2
3. a)	Name the various classical models of artificial neuron?	02	CO3
3.b)	Differentiate between Forward and Backward reasoning with example.	03	CO2
4. a)	State the equations for activation function and the output signal for McCulloch-Pitts model	02	CO3
4 b)	State the differences between Traditional methods and genetic algorithms methods of computation.	03	CO5
5.a)	Write a short note on Particle Swarm Optimization.	03	CO6
5.b)	What do you mean by the term radial basis function neural network (RBFNN) ?	02	CO3
6. a)	Explain briefly the concept of Principle Component Analysis (PCA)?	03	CO4
6.b)	How do we model an artificial neuron from a biological neuron?	02	CO3

GROUP – C
(Long Answer Type Questions)

(Answer any *three* of the following) **3 x 15 = 45**

		Marks	CO No
7. a)	Now suppose we have a third fuzzy set with bandwidth usage given by *Z = {0.3/10 + 0.6/20 + 0.7/40 +0.9/60 +1/80 +0.5/100}* Find S = Z * R i) using max – min composition ii) using max – product composition	06	CO2
7. b)	Explain briefly Self organization map (SOM) with respect to competitive learning.	05	CO4
7. c)	What do you mean by Rough Sets?	04	CO6

8. a)	State basic topological structures of Artificial Neural network?	02	CO3
8.b)	Briefly discuss about explanation-based learning.	04	CO4
8.c)	How forward feedback neural network is different from Backward feedback neural network?	05	CO2
8.d)	How genetic Algorithms is applied to overcome optimization problems?	04	CO5
9.a)	What are the characteristics features of Expert System?	04	CO4
9.b)	Justify the importance of encoding in genetic algorithm.	04	CO5
9.c)	Let *X* and *Y*be fuzzy sets with the following membership functions. *X = {0.2/10 + 0.5/20 + 0.8/40 + 1/60 +0.6/80 + 0.1/100}* *Y = {0.3/0.5 + 0.6/1 + 0.9/1.5 + 1.0/4 + 0.6/8 + 0.3/20}* Find the Cartesian product represented by relation R = *X + Y*	03	CO2
9.d)	Discuss the methods of defuzzification.	04	CO2
10.a)	What do you mean by crossover rate and mutation rate?	04	CO5
10.b)	Explain base on which biological concept the Artificial Life developed?	02	CO6
10.c)	How Artificial Immune systems has become one of the emerging areas of computational Intelligence?	04	CO6
10.d)	Explain briefly the concept of K-means clustering.	05	CO4
11. a)	How Fuzzy C-means Clustering aids in pattern recognition with regard to computational Intelligence?	05	CO4
11. b)	Differentiate between Supervised Learning and Un-Supervised Learning.	05	CO4
11. c)	How feature selection is executed using Principle Component Analysis technique (PCA) ?	05	CO3