BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI (RAJ.

CE F417 **Application of Artificial Intelligence in Civil engineering** Duration: 180mts
Date:9.12.2017 Comprehensive Examination (OB) MM: 140

1. A person has to collect the samples of water from wells A, B, C, D, and E. He will come back to the same point from where he has started (i.e. if he starts from A, he will go to B, C, D, E, and come back to A). The distances among them are given in table 1. Find the shortest cumulative distance. (use the random table given at the end; proceed row wise)

	A	B	C	D	E
A		38	21	29	33
B	38		58	9	45
C	21	58		49	48
D	29	9	49		39
E	33	45	48	39	

Take

1. Population size = 6 2. Cross-over probability = 0.6, 3. Mutation probability = 0.05
2. Iteration (initial + 2) = 3

(35)

Q.2 For the given construction network, with optimistic, pessimistic, and likely duration, calculate the following:
(a) Define the fuzzy membership (for duration) for each activity separately
(b) Calculate the fuzzy membership of completion of the project
(c) Calculate the crisp value of completion of project using defuzzification

Activity	Most optimistic time	Most likely time	Pessimistic time
1-2	2	5	8
1-3	1	4	7
2-3	0	0	0
2-4	2	4	6
3-4	5	7	12
3-5	4	4	4
4-5	3	9	10

$(m, \alpha, \beta)_{LR} \oplus (n, \gamma, \delta)_{LR} = (m+n, \alpha+\gamma, \beta+\delta)_{LR}$

(35)

Q.3 In the design of roof trusses, preliminary dimensions are to be assumed to calculate dead weight of truss for analysis. A neural network approach is to be incorporated for the preliminary design of trusses. The input and output variables are given below:

Input				Output of different type of areas/ 7000			
Span/40	Slope/40	Access	Spacing/10	Type 1	Type 2	Type 3	Type 4
0.225	0.6	1	0.4	0.3245	0.3245	0.136	0.136
0.225	0.65	0	0.4	0.3245	0.3245	0.136	0.136
0.4	0.6625	1	0.7	0.4674	0.4674	0.247	0.1934
0.5	0.45	1	0.5	0.685	0.685	0.193	0.299

Access = 1 means access provided and 0 means no provided. Train the network with the given data and infer to find the areas of the members of a truss of span 32 m with a slope of 20 degrees and access not provided with spacing of 3m.
(a) Use BPN (4-4-4), (b) Complete 2 epochs only

(45)

Q.4 Write the algorithm if you have to use BPN, Fuzzy, and Genetic algorithm to solve a problem (15)

Q.5 Fill in the blanks (1x14)

1. Fuzzy logic is a form of

a) Two-valued logic b) Crisp set logic c) Many-valued logic d) Binary set logic

2. The truth values of traditional set theory is _____ and that of fuzzy set is _____

a) Either 0 or 1, between 0 & 1 b) Between 0 & 1, either 0 or 1

c) Between 0 & 1, between 0 & 1 d) Either 0 or 1, either 0 or 1

3. The room temperature is hot. Here the hot (use of linguistic variable is used) can be represented by _____

a) Fuzzy Set b) Crisp Set c) Fuzzy & Crisp Set d) None of the mentioned

4. The values of the set membership is represented by

a) Discrete Set b) Degree of truth c) Probabilities d) Both Degree of truth & Probabilities

5. Fuzzy Set theory defines fuzzy operators. Choose the fuzzy operators from the following.

a) AND b) OR c) NOT d) All of the mentioned

6. There are also other operators, more linguistic in nature, called _____ that can be applied to fuzzy set theory.

a) Hedges b) Lingual Variable c) Fuzz Variable d) None of the mentioned

7. Fuzzy logic is usually represented as

a) IF-THEN-ELSE rules b) IF-THEN rules c) Both IF-THEN-ELSE rules & IF-THEN rules

d) None of the mentioned

8. An auto-associative network is:

a) a neural network that contains no loops b) a neural network that contains feedback

c) a neural network that has only one loop d) a single layer feed-forward neural network with pre-processing

9. A 4-input neuron has weights 1, 2, 3 and 4. The transfer function is linear with the constant of proportionality being equal to 2. The inputs are 4, 10, 5 and 20 respectively. The output will be:

a) 238 b) 76 c) 119 d) 123

10. Which of the following is true?

(i) On average, neural networks have higher computational rates than conventional computers.

(ii) Neural networks learn by example.

(iii) Neural networks mimic the way the human brain works.

a) All of the mentioned are true b) (ii) and (iii) are true c) (i), (ii) and (iii) are true

d) None of the mentioned

11. Which of the following is true for neural networks?

(i) The training time depends on the size of the network.

(ii) Neural networks can be simulated on a conventional computer.

(iii) Artificial neurons are identical in operation to biological ones.

a) All of the mentioned b) (ii) is true c) (i) and (ii) are true d) None of the mentioned

12. What are the advantages of neural networks over conventional computers?

(i) They have the ability to learn by example

(ii) They are more fault tolerant
(iii)They are more suited for real time operation due to their high 'computational' rates
a) (i) and (ii) are true b) (i) and (iii) are true c) Only (i) d) All of the mentioned

13. Instead of representing knowledge in a relatively declarative, static way (as a bunch of things that are true), rule-based system represent knowledge in terms of_____ that tell you what you should do or what you could conclude in different situations.
a) Raw Text b) A bunch of rules c) Summarized Text d) Collection of various Texts

14. A Horn clause is a clause with _____ positive literal.
a) At least one b) At most one c) None d) All

Q.6 State True (T) or False (F) with explanation (8x1.5)
(Answer with no explanation carries no marks; If your answer is correct, but explanation is wrong, you will be awarded no marks; if your answer is wrong and so the explanation, you will be awarded 100% negative marks)

1. Traditional set theory is also known as Crisp Set theory.
2. Fuzzy logic is extension of Crisp set with an extension of handling the concept of Partial Truth.
3. Japanese were the first to utilize fuzzy logic practically on high-speed trains in Sendai.
4. A rule-based system consists of a bunch of IF-THEN rules.
5. In a backward chaining system you start with the initial facts, and keep using the rules to draw new conclusions (or take certain actions) given those facts.
6. In a backward chaining system, you start with some hypothesis (or goal) you are trying to prove, and keep looking for rules that would allow you to conclude that hypothesis, perhaps setting new sub-goals to prove as you go. State whether true or false.
7. An expert system is a computer program that contains some of the subject-specific knowledge of one or more human experts.
8. A knowledge engineer has the job of extracting knowledge from an expert and building the expert system knowledge base.

Random Table

73735	45963	78134	63873
02965	58303	90708	20025
98859	23851	27965	62394
33666	62570	64775	78428
81666	26440	20422	05720
15838	47174	76866	14330
89793	34378	08730	56522
78155	22466	81978	57323
16381	66207	11698	99314
75002	80827	53867	37797
99982	27601	62686	44711
84543	87442	50033	14021
77757	54043	46176	42391
80871	32792	87989	72248
30500	28220	12444	71840