7. The discretized membership functions for a transistor and a resistor are given below :

T {0/0 + 0·2/1 + 0·7/2 + 0·8/3 + 0·9/4 + 1/5}

R {0/0 + 0·1/1 + 0·3/2 + 0·2/3 + 0·4/4 + 0·5/5}

Find the following :

(a) Algebraic sum

(b) Algebraic product

(c) Bounded sum

(d) Bounded difference 2×4=8

[Internal Assessment—5+5]

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2024

M.Sc. 2nd Semester Examination

Computer Science

PAPER : COS–203

(Artificial Intelligence & Soft Computing)

Full Marks : 40

Time : 2 hours

The figures in the right-hand margin indicate marks.

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

Illustrate the answers wherever necessary.

Answer from both the Sections

SECTION—A

(M1/Marks : 20)

(Artificial Intelligence)

GROUP—A

1. Answer *any* **two** questions : 2×2=4

(a) What is the difference between strong AI and weak AI?

(b) Why is heuristic search better than blind search?

(c) Differentiate between DFS and BFS.

(d) Show the truth table of implication connective.

GROUP—B

2. Answer *any* **two** questions : 4×2=8

(a) Define heuristic function. Give one example of heuristic function for 8-puzzle problem. Is your heuristic admissible? How will you prove that is it admissible or not? 1+1+2=4

(b) Translate the following English sentences into predicate logic : 4

(i) There is a girl who likes all dogs who are not black.

(ii) No person likes dull pets.

(iii) Not all students take both History and Biology.

(iv) Only one student failed in History.

(c) Compare Greedy Best first search and A search algorithm based on the following performance measures with justification : 4

Complete, optimal, time and space complexity.

(d) Describe the crossover and mutation operators in Genetic Algorithm with suitable example. 2+2=4

we define two fuzzy sets A and B representing the conditions of "near" a mach number of 0·65 and "in the region" of a mach number of 0·65, respectively, as follows :

A near mach 0·65

A {0/0·64 + 0·75/0·645 + 1/0·65 + 0·5/0·655 + 0/0·66}

B in the region of mach 0·65

B {0/0·64 + 0·25/0·645 + 0·75/0·65 + 1/0·655 + 0·5/0·66}

For these two fuzzy sets create *(i)* $A \quad B$, *(ii)* $A \quad B$, *(iii)* $\overline{A} \quad \overline{B}$ and *(iv)* $\overline{A}$. 1×4=4

4. How does genetic algorithm (GA) differ from traditional algorithm? What is Roulette wheel selection in GA? 2+2=4

5. What is a Hopfield net? State the advantages of associative memory. 2+2=4

GROUP—C

Answer *any* **one** question : 8

6. Write the expression for binary and bipolar sigmoid activation function. Why is the McCulloch Pitts neuron widely used in logic functions? Distinguish between artificial neuron and biological neuron. 2+2+4=8

SECTION—B

(M2/Marks : 20)

(Soft Computing)

GROUP—A

1. Answer *any* **two** questions : 2×2=4

(a) What is fuzzy inference system?

(b) What is fuzzification?

(c) Compare soft computing with hard computing.

(d) Define one-point crossover.

GROUP—B

Answer *any* **two** questions : 4×2=8

2. Compare the following two fuzzy relations $R1$ and $R2$, using max-min and max-product compositions : 2+2=4

[$R1$	$y1$	$y2$	$y3$	$y4$
$x1$	0·3	0	0·7	0·3
$x2$	0	1	0·2	0]

[$R2$	$z1$	$z2$	$z3$
$y1$	0·1	0·2	0·4
$y2$	0·8	0·3	1·0
$y3$	0·7	0·9	0·6
$y4$	1	0·2	0·1]

3. For aircraft simulator data the determination of certain changes in its operating conditions is made on the basis of hard break points in the mach region,

GROUP—C

3. Answer *any* **one** question : 8

(a) Consider the given instance of 8-puzzle :

1	2	3
4	5	6
7	8	

Goal state

1	6	2
4		3
7	5	8

Initial state

(i) Formulate the problem as state space search problem.

(ii) Draw the implicit search graph.

(iii) Apply IDS to the graph and show the resulting path. 2+3+3=8

(b) Apply alpha-beta pruning on the following game tree considering first node as MAX and identify which are alpha cut offs and which are beta cut offs : 8