NISC – Home Assignment - 1

① demonstrate the working steps of Cuckoo Search algorithm.

(A) Cuckoo search is a nature inspired optimization algorithm used based on brood parasitism behaviour of cuckoo birds combined with Le'vy flight for exploration.

working steps:

1) Initialize a population of nests (solutions)
2) Generate a new solution using Levy flight
3) Evaluate the fitness of the new condition
4) Replace a randomly chosen nest if the new solution is better.
5) Abandon a fraction of the worst nests and Create new ones.
6) Keep the best solutions and repeat until stopping condition is met.

② explain the fuzzy T-norm & T-Conorm operator with example

4) T- Norm (Triangular norm):

Presents the fuzzy AND operation

Ex:

If A=0.6 and B=0.8

minimum T-norm:

$$T(A,B) = \min(0.6, 0.8) = 0.6$$

T- Conorm (S-norm):

Represents the Fuzzy OR operation

Example:

maximum T- Conorm:

$$S(A,B) = \max(0.6, 0.8) = 0.8$$

5) What is generic algorithm? Explain three basic types of operators used in genetic algorithm.

(A) Generic Algorithm (GA) is an evolutionary optimization technique inspired by natural selection.

Basic Operators:

1) Selection: Chooses the best individuals for reproduction

2) Crossover: Combines genes of 2 parents to create offspring.

5) mutation :- Randomly alters genes to maintain diversity.

4) Explain Grey wolf optimizer (GWO) algorithm with hierarchy.

(A) Grey wolf optimizer is a swarm-based algorithm inspired by the hunting behaviour of grey wolves.

Hierarchy :-

→ Alpha (α) :- Best solution (leader)
→ Beta (β) :- Second best solution
→ Delta (δ) :- Third best solution
→ omega (ω) :- Remaining wolves.

working principle :-

→ wolves updates their positions based on α, β & δ
→ The algorithm balances exploration & exploitation
→ Iteration continue until the optimal solution is found.