Ant colony optimisation

* It is proposed by Macro Danigo in 1992
* It is a BIO-Inspired algorithm which is based on the swarm intellegence.

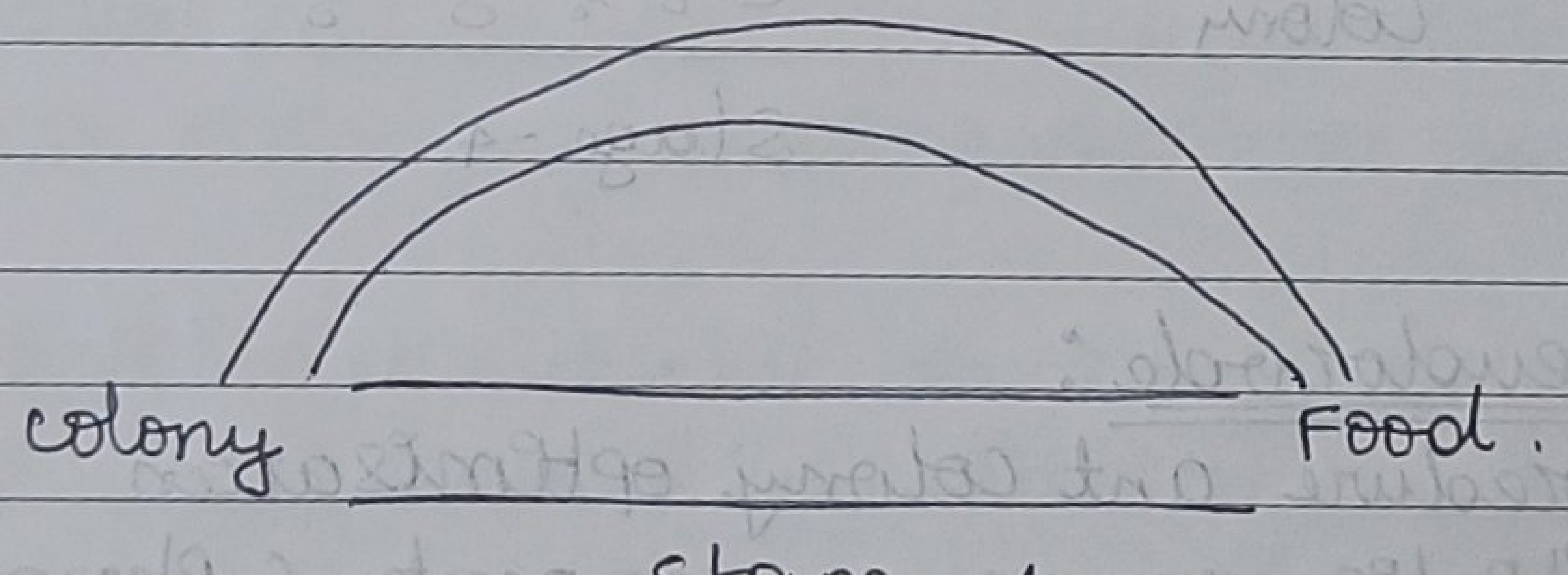
The Main Motive of Ant colony optimisation algorithm is Ant should move from ant colony to the food in a shortest path with the help of Pheromones.
↳ here pheromone is a saliva of ant.

4 Stages of Ant colony optimisation.

Stage - 1

⇒ All ants are in Ant colony

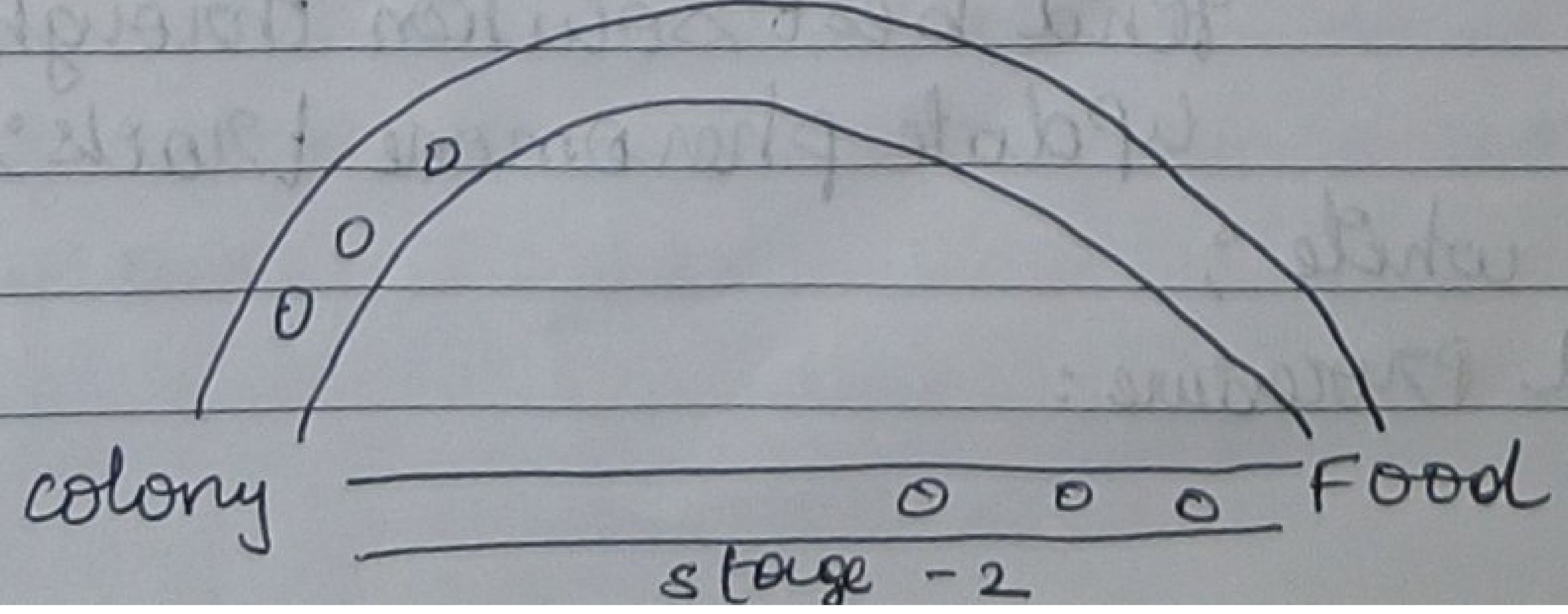
⇒ No ant is moving in stage 1. so there is no pheromone in the environment since we dont know which path have to be taken.



stage - 1

Stage - 2

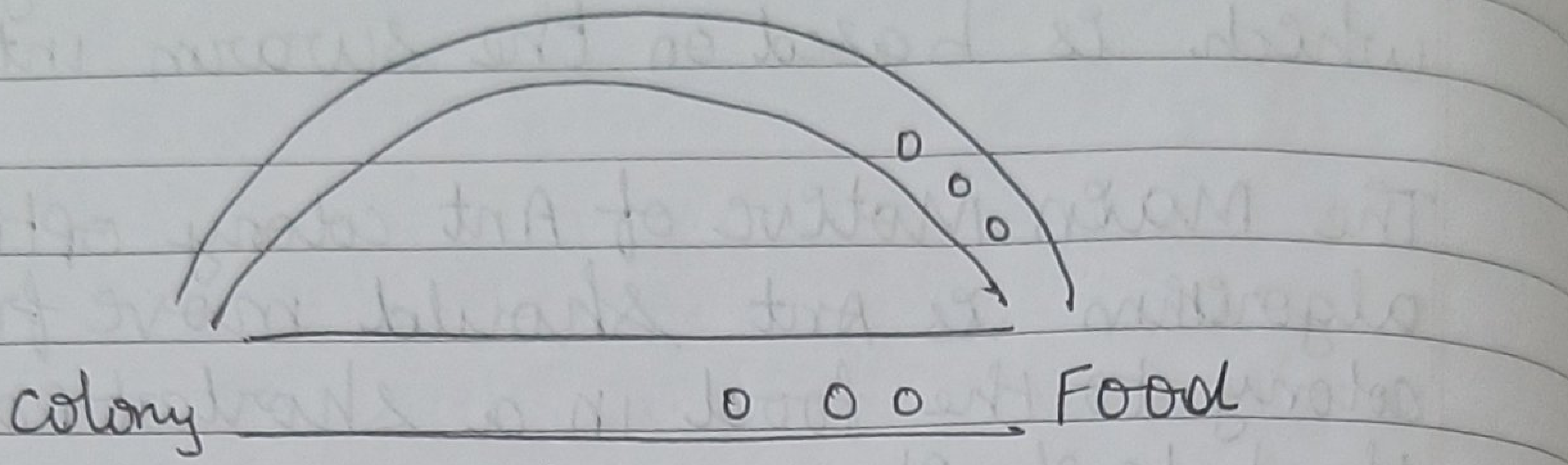
⇒ 0.5% they are trying with diffrent path find the shortest path.



stage - 2

Stage-3

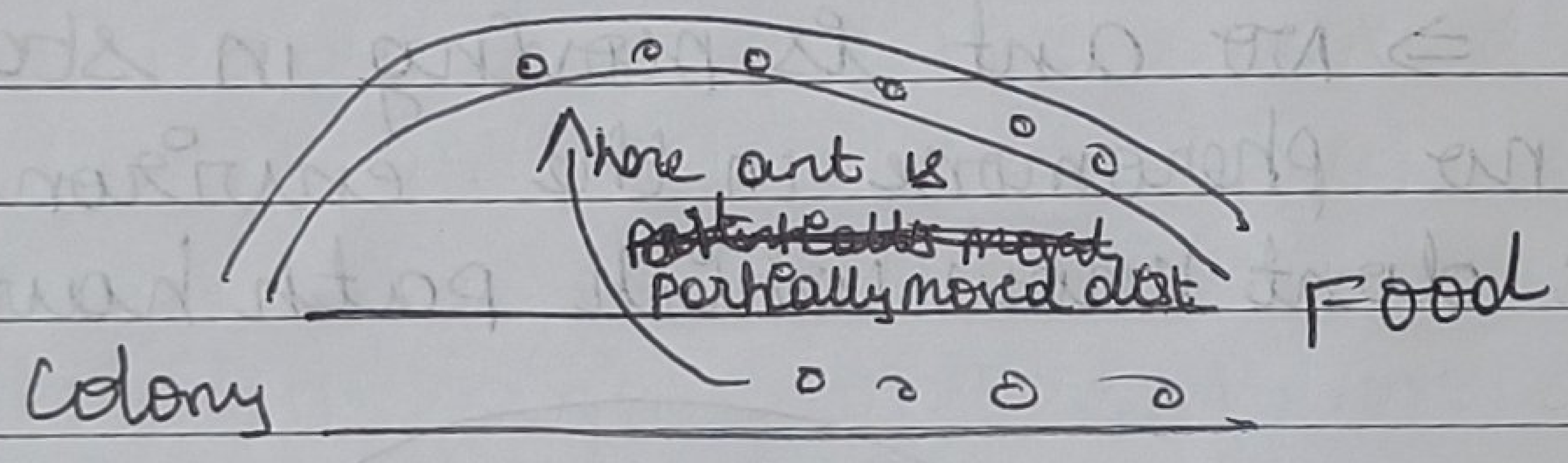
in the stage 3 shortest path is found.



Stage-3

Stage-4

Possible ways are observed & the ant moves into the shortest path.

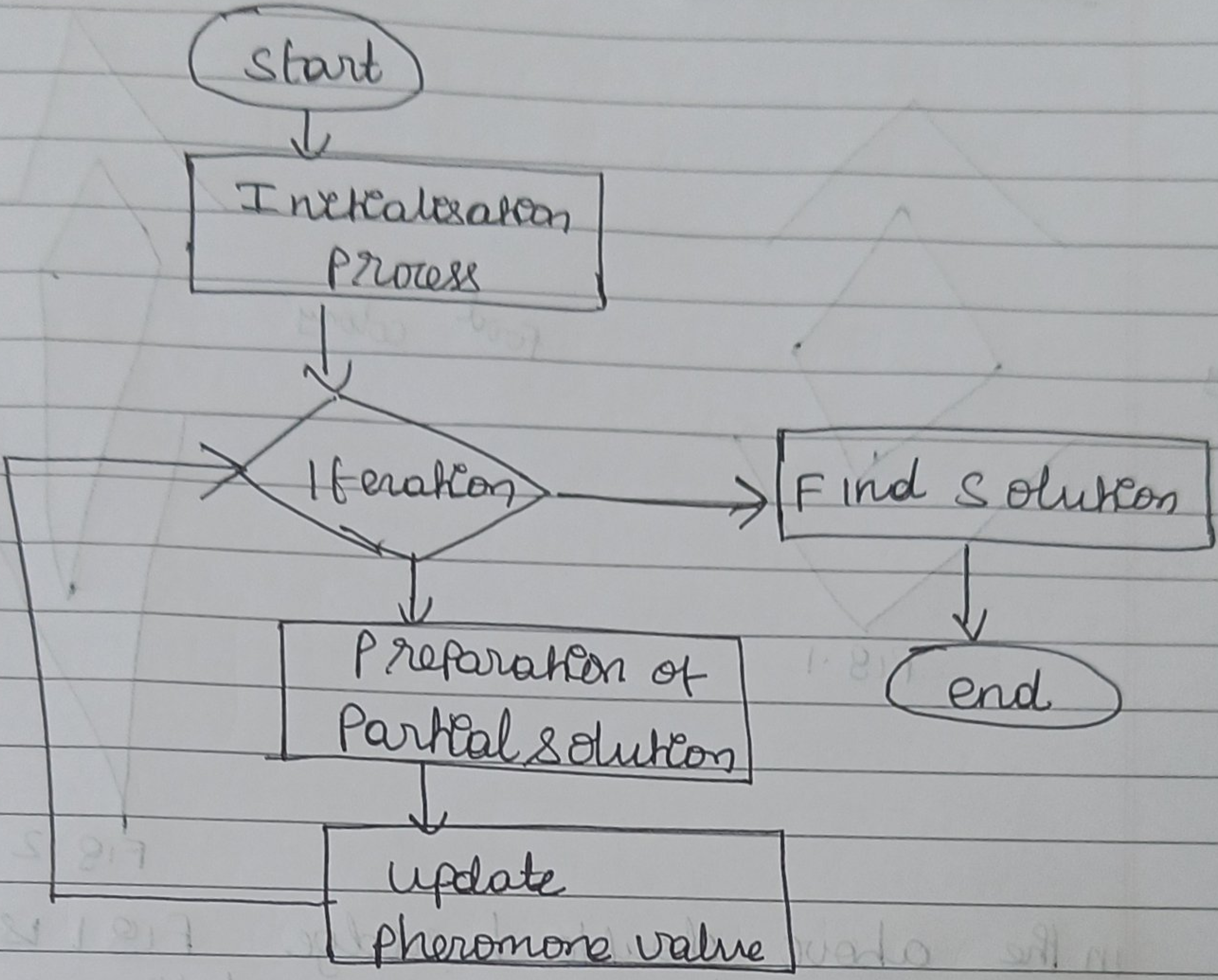


Stage-4

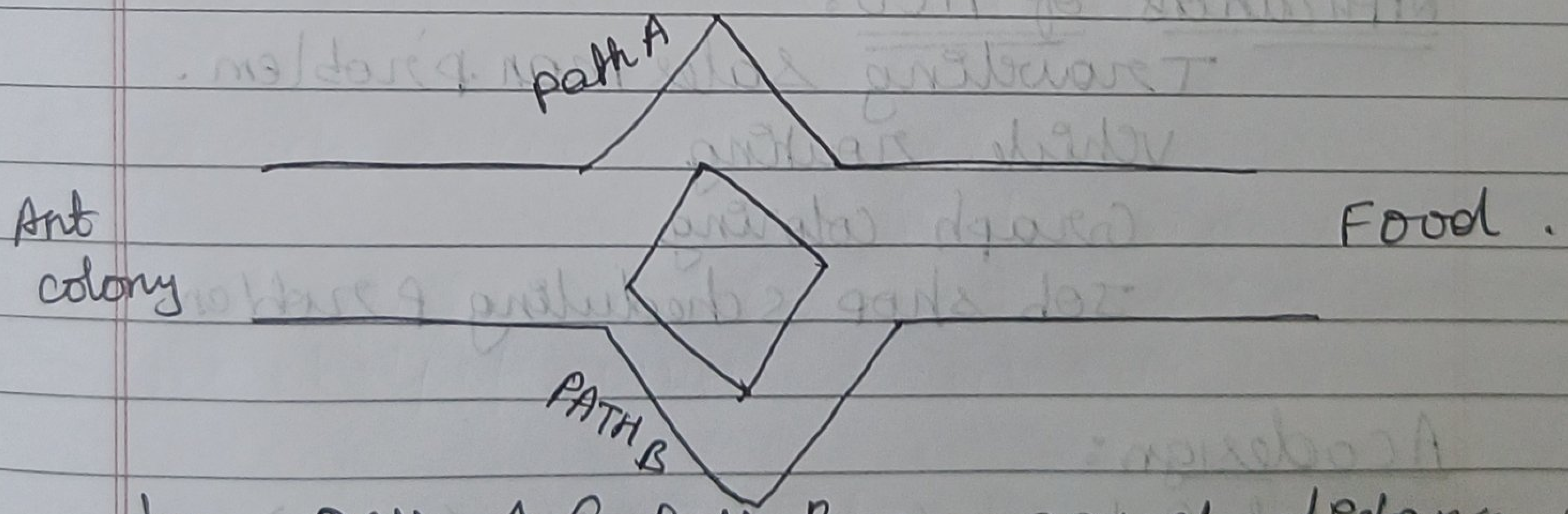
Pseudocode:

Procedure ant colony optimisation.
Initialise necessary parameter & Pheromone trails;
while not termination do:
    Generate ant population;
    calculate fitness value association with each ant;
    find best solution through selection methods
    update pheromone trails;
end while;
end procedure:

Flowchart of ACO.



Foraging behaviour of ACO:



here PAth A & path B are equal distance so what ever path we follow it takes a same time to reach a distination.

Double bridge.

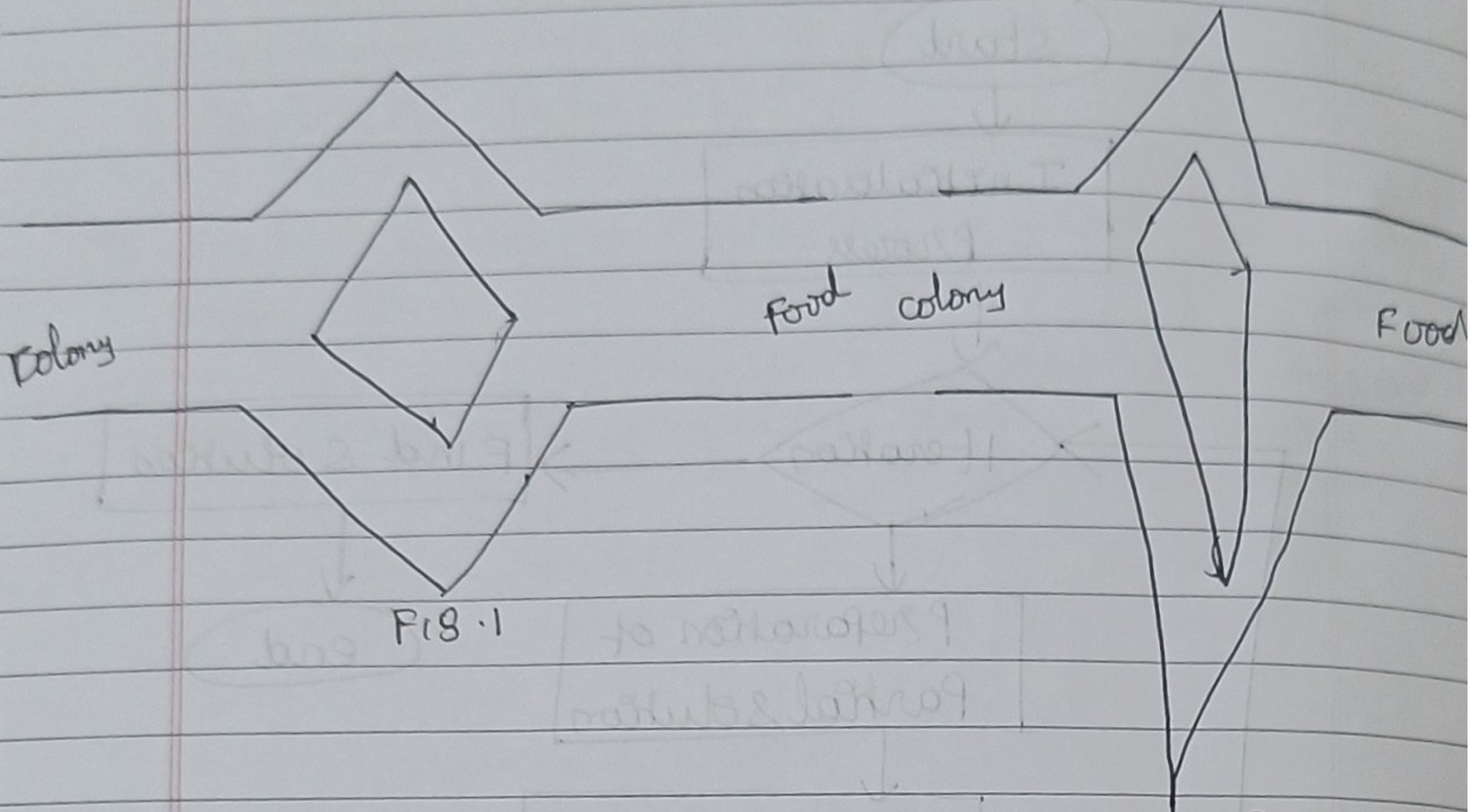


Fig.1

Fig:2

in the above double bridge Fig 1 is the shortest path to reach the destination so fig 1 is the best shortest path.

Applications of ACO:

- Travelling sales man problem.
- vehicle routing
- Graph coloring
- Job shop scheduling problem

ACO design:

Let G be a Graph $G = (V, E)$

V → vertex E → Edges

E_1, E_2 - two edges, L_1, L_2 - Length

R_1, R_2 - pheromone values.

V_S - source vertex (Ant colony)

V_D = Destination vertex (Food).

probability for selecting a path $P_i = \dfrac{R_i}{R_1 + R_2}$; $i = 1, 2$