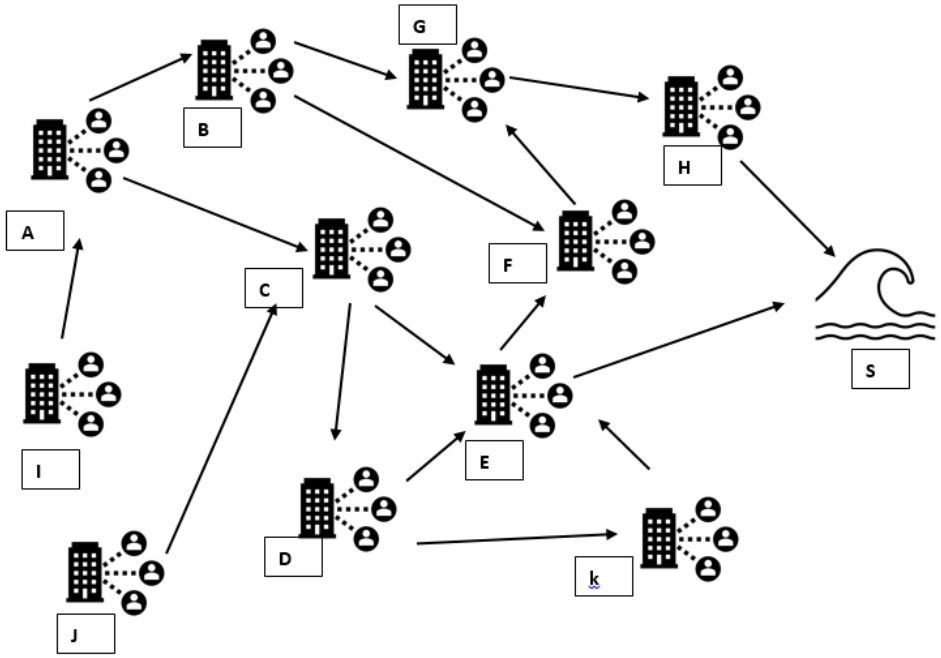
Artificial and Computational Intelligence

Assignment 1

Water Channel Navigation Agent

Problem statement

To prevent floods in Chennai, the city has designed a network of water channels that interconnect various locations within the city. Each channel is a pathway that water can flow through, connecting two different locations finally leading to the Sea. Each location has gates to regulate the flow of water (Open /Close) and only one gate from any of the locations to the sea can be open. The network is represented as a graph where locations are nodes, and channels are edges connecting these nodes. The water channels are unidirectional, meaning water can travel only in one direction in a channel.



1. Find the shortest path from a designated water discharge start location (source node) to a target location ie the Sea (destination node). This is crucial for emergency response.
2. Efficiently plan the route for inspection and maintenance crews to visit every location in the network at least once, ensuring the health and safety of the water channel system.

Use the following algorithms to solve the problem:

1. **IDA***
2. **Hill Climbing**

Route		Cost
A	B	2
A	C	1
B	F	1
B	G	1
C	D	2
C	E	2
D	E	1
D	K	1
E	F	3
E	S	2
F	G	1
G	H	1
H	S	1
I	A	2
J	C	1
K	E	1

Answer the following:

1. Explain the environment of the agent [20% weightage]
2. Define the heuristic and or fitness function for the given algorithms and the given problem. [20% weightage]
3. Use appropriate data structures and implement given informed and local search algorithm and Print the path taken by the agent. [40% weightage]
4. Find and print space and time complexity using code in your implementation. [20% weightage]

Note:

- You are provided with the python notebook template which stipulates the structure of code and documentation. Use well intended python code.
- Use separate MS word document for explaining the theory part. Do not include theory part in the Python notebook except Python comments.
- The implementation code must be completely original and executable.
- Please keep your work (code, documentation) confidential. If your code is found to be plagiarized, you will be penalized severely. Parties involved in the copy will be considered equal partners and will be penalized severely.