

# BITS F327 AI for Robotics

BITS-Pilani, Hyderabad/Goa, 2022-23-II

Mid-sem Exam, 13<sup>th</sup> March, 2023

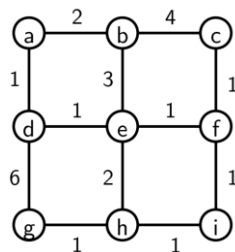
Duration: 90 mins.

[Close Book/Note Exam]

Total Marks: 45

## Answer all Questions

1. Explain with proper example –
  - a. How are Genetic *Algorithms* related to *Darwinian Natural Selection*? [1]
  - b. In GA why mutation operation is required. [3]
  - c. Explain two different types of Mutation operation. [2+2]
  - d. Discuss two disadvantages of GA. [1+1]
  - e. What are the differences between *GA* and *Traditional Search and Optimization Algorithms*? [2]
  
2. For a differential drive mobile robot: Derive the Mapping between Robot velocities to wheel velocities. [5]
  
3. A robot has to close a door while it is open. A sensor is sensing and continuously sending data for the state of the door. After recording the data 8 times it is found that 5 times it detected that the door is open. If the door is open, the action “close door” succeeds in 90% of all cases.
  - a. Find out the probability of closing the door successfully. [6]
  - b. If the sensor can sense the door closing correctly 80% of the time, what is the probability of finding the door closed after the action. [4]
  
4. Path planning
  - a. Consider the following map in a graph representation with major landmarks and distances. Show the steps of Dijkstra’s algorithm for finding out the shortest path for starting node ‘g’ and goal node ‘a’. [8]



- b. What is a raise state in D\* algorithm? Explain with an example. [2]

- c. Explain with examples one step of RRT expansion and path smoothing method. [2+2]
- d. What is acyclicity? Why is acyclicity important for the PRM algorithm? [2]
5. Is 16-Bit or 32-Bit Color Better? Explain. [2]

~End~