SPRING MID SEMESTER EXAMINATION-2025

School of Computer Engineering
Kalinga Institute of Industrial Technology, Deemed to be University
Artificial Intelligence
[(CS30002)]

Time: 1 1/2 Hours **Full Mark: 20**

Answer Any four questions including question No.1 which is compulsory.
The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable and all parts of a question should be answered at one place only.

1. Answer all the questions. [1 Mark X 5]

   a) The performance measure is very crucial for a rational agent. Justify
   b) Consider the following heuristics for a path finding problem on a 2D grid:

      H1(n) = Euclidean distance to the goal

      H2(n) = Twice the Euclidean distance to the goal .

      Which of these heuristics are admissible and why?

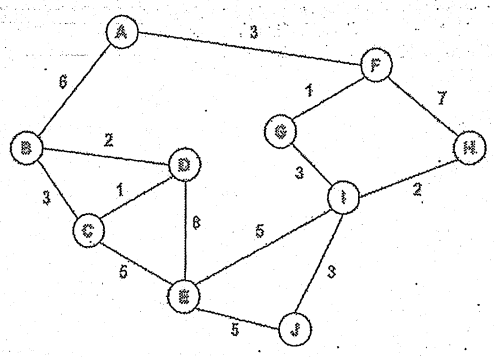
   c) Differentiate between goal based agent and utility based agent? With proper diagram.

   d) Provide the Performance and Environment components for PEAS of AI Powered Drone for environment monitoring?

   e) What is the functional difference between Hill Climbing and Greedy Best First Search Algorithm?

2. (a) Find the path from A to J using Breadth First Search. Show the contents of the data structure after each step. Break ties by visiting lexicographically earlier nodes first.

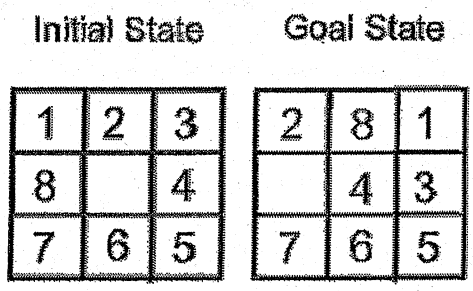
[3 Marks]



(b) Prove / Disprove the following statement:-

"The time complexity of Iterative deepening depth-first search is asymptotically similar to breadth first search". [2 Marks]

3. (a) Find the path from the initial state to goal state for the following 8-puzzle problem using the A* algorithm. Use Manhattan distance to calculate the heuristic value. [3 Marks]



(b) Prove/Disprove the following statement with proper example:-

"A heuristic is Admissible if and only if it is Consistent" . [2 Marks]

4. (a) Provide the state space representation of the following problems:- [2.5 Marks]

(i) 8-Puzzle.

(ii) N-Queen.

(b) From the above problems, choose any one of the problem and describe the approach of applying Steepest Hill Climbing for searching the goal state. Choose any admissible heuristic. [2.5 Marks]

5. (a) How Simulated Annealing provides opportunity to states that are not promising ? [2 Marks]

(b) Apply genetic algorithm to maximize the below equation. For creating individuals for the population take the binary representation for the values of variable x. Starting with initial population of 5 individuals, show the selection, crossover and mutation steps. Show the process for one iteration. For crossover, mutation and selection process you may take appropriate assumptions of your choice.

$$f(x) = -\frac{x^2}{10} + 3x$$

$$1 < x < 31$$

[3 Marks]

*** Best of Luck ***