Jahangirnagar University
Department of Computer Science and Engineering
Fourth Year Second Semester B.Sc. (Hons.) Final Examination -2022

Course Title: **Artificial Intelligence** Course No: **CSE-453**
Full Marks: 60 Time: 3 Hrs.

[Answer each of the following questions. Each question carries equal marks. Figures in the right margin indicate marks.]

1. Answer all questions:
   a) What is intelligence? Mention 3 pioneers of AI along with their inventions 2
   b) Mention some limitations of Hill-climbing method. 2
   c) What do you understand by AI winter? 2
   d) What are the basic components of Semantic Net? Give an example. 2
   e) Mention the parameters to measure the performance of a rational agent? 2
   f) What is parsing and lexical analysis? 2

2. Answer **Any Three** out of **Four** questions:
   a) What is the discrepancy between propositional logic and FOPL in terms of knowledge representation? 4
   b) Differentiate between inductive and deductive knowledge with examples. 4
   c) Make a comparison between BFS and DFS strategies. Why iterative deepening is preferred over BFS and DFS? 4
   d) Clarify rational agent and also illustrate the classification of agents and environments. 4

3. Answer **Any Three** out of **Four** questions:
   a) Represent the following inferences in FOPL 4
      (i) Richard is a king. If a king is greedy, he can be treated as an evil. So, Richard is an evil.
      (ii) Some people are not happy with their income.
   b) Find the meaning of the following FOPL expressions: 4
      i) ∀x((mushroom(x) ^ purple(x)) => poisonous(x).
      ii) $\exists_x$ ON(x, table) → IS-A(x, robot)^AIBO(x).
      iii) ∀x (StudiesAt(x;Koblen)=>Smart(x).
      iv) ∀x IsAStudent(x) ∧ IsTakingAI(x) ⇒ IsCool(x).
   c) Apply the PROLOG to represent the following expressions. 4
      (i) All tigers are ferocious. Royal Bengal is a tiger. So, Royal Bengal is also ferocious.
      (ii) Miss X prefers to sing classical and modern songs. She is liked by all Bangladeshis because of her sweet melodies.
   d) How knowledge can be represented from human brain to computer? 4

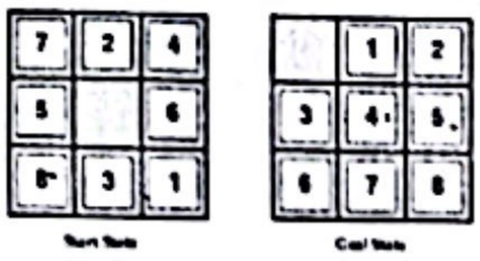
4. Answer **Any Three** out of **Four** questions:

a) Correlate between (i) Gradient search technique and Hill-Climbing approach, (ii) genotype and phenotype 4

b) Consider a state space where the start state is number 1 and the successor function for state n returns two states, numbers 2n and 2n+1. Now suppose the goal state is 24. List the order in which nodes will be visited and also calculate and compare the cost using (i) BFS technique (ii) iterative deepening technique. 4

c) Explain greedy and A* search mechanisms in finding a goal. 4

d) For following puzzle deduce the (i) total Manhattan distance of the tiles from their goal positions, (ii) true cost using A* search. 4



5. Answer **Any Two** out of **Three** questions:

a) Compile the following knowledge using (i) Semantic net and (ii) Frame-based approach: 6

In the heart of the city, nestled among towering skyscrapers, lies a quaint little café. Its warm ambiance and the aroma of freshly brewed coffee draw in patrons from all walks of life. The sound of friendly chatter fills the air as people sip their drinks and indulge in delectable pastries.

b) It is necessary to optimize (maximize) the following function. Genetic Algorithm is a good way to optimize this function. Evaluate the fitness for two generations. 6

$$f(x) = \frac{x^4 + 5x^2 + 10}{x^3 + 7x^2 - 6}$$

c) A University wants to select students for MSc enrolment based on undergraduate CGPA and viva scores. The maximum score of CGPA is 4.0 and that of viva is 10. Assume each score can be fuzzified into three categories: High, Medium, and Low, and the final decision would be Excellent, Very Good, Good, Fair, and poor. A student's GPA score is 3.2 and viva score is 6. Specify the decision that can be taken about this student using your developed fuzzy system? You also have to generate all membership graphs in converting crisp to fuzzy. 6