using iterative deepening finds a suboptimal solution. 1+4=5

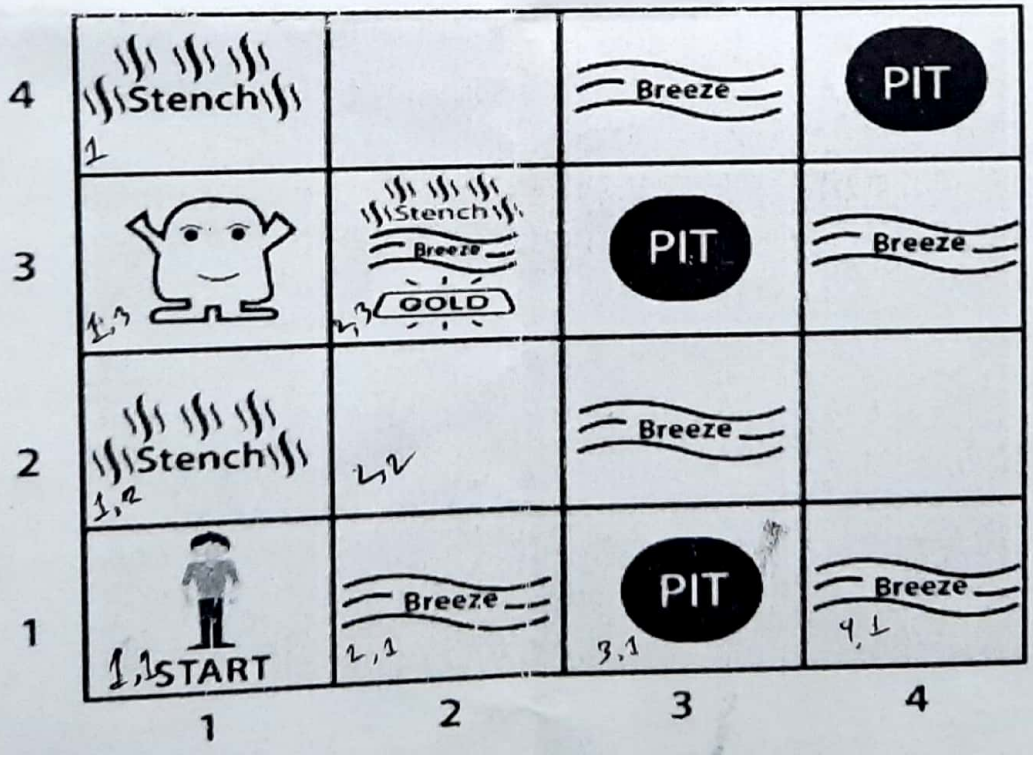
Patuakhali Science and Technology University

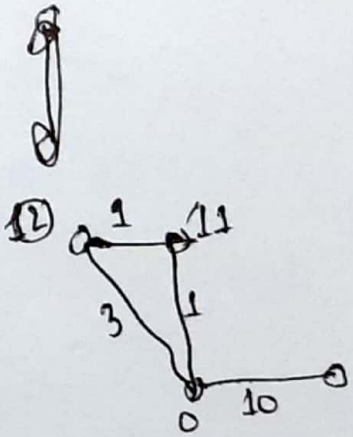
B.Sc. Engg. (CSE) 3rd Semester (Level-2 Semester-I) Mid **Examination** of January-June 2022

Course Code: CIT-315 Course Title: Artificial Intelligence

Session 2019-20 Credit Hour: 1.5 Full Marks: 15 Duration: 1 Hour

1. Prove that uniform-cost search and breadth-first search with constant step costs are optimal when used with the GRAPH-SEARCH algorithm. Compare the four evaluation criteria set of several uninformed search strategies. 5
2. What is the heuristic function of an informed search strategy? How to minimize the total estimated solution cost using the best-first search, A* search, algorithm. Show the heuristic must be admissible and consistent for the optimal solution in the A* search algorithm. 4
3. Define knowledge-based agents. Drives a propositional logic from the following Wumpus world is a cave consisting of rooms connected by passageways. Consider that the Wumpus moves from (1,3) to (2,3) as a dynamic movement. Now prove that the Wumpus is in (2,3). 6





Patuakhali Science and Technology University

B.Sc. Engg. (CSE) 5th Semester (Level-3, Semester-I) Final Examination January-June 2022

Course code: CIT-315 Course Title: Artificial Intelligence

Session: 2019-20 Credit hour: 3.00 Full marks: 70 Duration: 3 hours

[Figures in the right margin indicate full marks. Split answering of any question is not recommended]

*Answer any **5** of the following questions.*

1. (a) What does artificial intelligence mean? List the learning outcomes of AI. **3**

   (b) Define in your own words the following terminologies: agent, agent program, rationality, autonomy, deterministic, and stochastic. **6**

   (c) What is PEAS in specifying the task environment? Illustrate and describe the structure of the model-based reflex agent. **5**

2. (a) What is an uninformed search? Compare breadth first search, BFS, and depth first search, DFS, algorithms. Show that the 8-puzzle states are divided into two disjoint sets, such that no state in one set can be transformed into a state in the other set by any number of moves. **5**

   (b) Prove that uniform-cost search and breadth-first search with constant step costs are optimal when used with the GRAPH-SEARCH algorithm. Show a state space with constant step costs in which GRAPH-SEARCH using iterative deepening finds a suboptimal solution. **2+2=4**

   (c) What is the heuristic function of informed search strategy? How to minimize the total estimated solution cost using the best-first search, A* search, algorithm. Show the heuristic must be consistent for optimal solution in A* search algorithm. **1+4=5**

3. (a) Why do we use local search strategy to address optimization problem? What are the key advantages of local search algorithms? Demonstrate a one-dimensional state-space landscape in which elevation corresponds to the objective function. **2+3=5**

   (b) What are the reasons, problems, of the hill-climbing algorithm for getting stuck? How to escape these problems using the simulated-annealing search algorithm? **5**

   (c) Define constraint satisfaction problem, CSP. Formulate a map coloring problem of states and territories of Australia, which can be viewed as a CSP problem. The goal is to assign colors to each region so that no neighboring regions have the same color. The map-coloring problem represented as a constraint graph. **2+2=4**

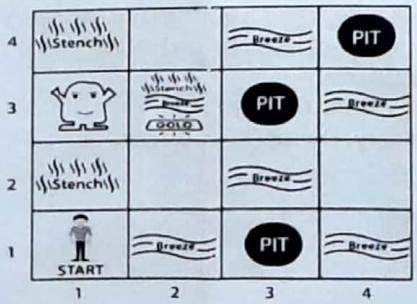
4. (a) Define the following terminologies in your own words: conditional probability, Bayes' rule, supervised learning, unsupervised learning. **3**

   (b) Compute the patient's probability of having the liver disease if they are an alcoholic. "Being an alcoholic" is the test (kind of like a litmus test) for liver disease. Past data tells you that 10% of patients entering your clinic have liver disease and 5% of the clinic's patients are alcoholics. You might also know that among those patients diagnosed with liver disease, 7% are alcoholics. Design a naïve Bayes model, Bayesian classifier based on the dentistry example. **2+3=5**

   (c) How to compute entropy and information gain from attributes in datasets for building decision tree as a classifier? What is a univariate linear regression? How to minimize the loss using gradient descent for fitting linear regression? **6**

5. (a) Define logical agent. Describe about knowledge representation language. **02**

   (b) What are the characteristics of the wumpus world problem? Develop propositional rules for the wumpus world and prove that wumpus is static in (1,3). Now prove that the Wumpus is in (1,3). **06**



02

(c) Which of the following are correct? Clarify.

i. $(A \wedge B) \models (A \Leftrightarrow B)$.

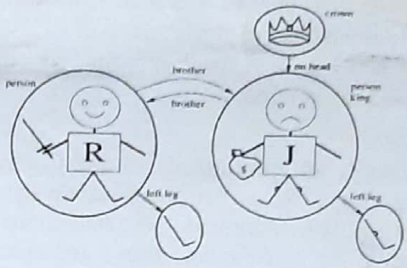
ii. $A \Leftrightarrow B \models \neg A \vee B$.

iii. $A \vee B) \wedge (\neg C \vee \neg D \vee E) \models (A \vee B \vee C) \wedge (B \wedge C \wedge D \Rightarrow E)$.

iv. $(A \wedge B) \Rightarrow C \models (A \Rightarrow C) \vee (B \Rightarrow C)$.

(d) What are the purposes of natural language processing with AI? Describe N-gram character model? How HITS algorithm played important roles in developing our understanding of web information retrieval. 04

6. (a) Define quantifiers. Consider the following model containing five objects, two binary relations, three unary relations (indicated by labels on the objects), and one unary function, left-leg develop first order logic for the model for the following facts. 02



i. King John is a king ⇒ King John is a person.

ii. King John and King Richard are siblings

(b) Translate the following English sentences to first order logic.

i. Every gardener likes the sun.

ii. You can fool some of the people all of the time.

iii. You can fool all of the people some of the time.

iv. All purple mushrooms are poisonous.

v. There are exactly two purple mushrooms.

vi. Clinton is not tall.

(c) Consider the facts husband(Joe, Mary), son(Fred, Joe), spouse(John, Nancy), male(John), son(Mark, Nancy), father(Jack, Nancy), daughter(Linda, Jack), daughter(Liz, Linda) and following rules for genealogical relations

i. $(\forall x,y)$ parent(x, y) ↔ child (y, x)

ii. $(\forall x,y)$ father(x, y) ↔ parent(x, y) ∧ male(x) (similarly for mother(x, y))

iii. $(\forall x,y)$ daughter(x, y) ↔ child(x, y) ∧ female(x) (similarly for son(x, y))

iv. $(\forall x,y)$ husband(x, y) ↔ spouse(x, y) ∧ male(x) (similarly for wife(x, y))

v. $(\forall x,y)$ spouse(x, y) ↔ spouse(y, x)

vi. $(\forall x,y)$ parent(x, y) → ancestor(x, y)

vii. $(\forall x,y)(\exists z)$ parent(x, z) ∧ ancestor(z, y) → ancestor(x, y)

viii. $(\forall x,y)$ descendant(x, y) ↔ ancestor(y, x)

ix. $(\forall x,y)(\exists z)$ ancestor(z, x) ∧ ancestor(z, y) → relative(x, y)

x. $(\forall x,y)$ spouse(x, y) → relative(x, y) (related by marriage)

xi. $(\forall x,y)(\exists z)$ relative(z, x) ∧ relative(z, y) → relative(x, y)

xii. $(\forall x,y)$ relative(x, y) ↔ relative(y, x)

Now find the result of the queries **(a) ancestor(Jack, Fred, (b) relative(Liz, Joe) (c) relative(Nancy, Matthew)**

(d) In each of the following, given an English sentence and a number of candidate logical expressions. For each of the logical expressions, state whether it (1) correctly expresses the English sentence; (2) is syntactically invalid and therefore meaningless; or (3) is syntactically valid but does not express the meaning of the English sentence. 03

A. Every cat loves its mother or father.

(i) ∀ x Cat (x) ⇒ Loves(x, Mother (x) ∨ Father (x)).

(ii) ∀ x ¬Cat(x) ∨ Loves(x, Mother (x)) ∨ Loves(x, Father (x)).

B. Every dog who loves one of its brothers is happy.

(i) ∀ x Dog(x) ∧ (∃y Brother (y, x) ∧ Loves(x, y)) ⇒ Happy(x).

(ii) ∀ x, y Dog(x) ∧ Brother (y, x) ∧ Loves(x, y) ⇒ Happy(x).

C. No dog bites a child of its owner.

(i) ∀ x Dog(x) ⇒ ¬Bites(x, Child (Owner (x))).

(ii) ¬∃ x, y Dog(x) ∧ Child (y, Owner (x)) ∧ Bites(x, y).

AI

5th Semester (Level-3, Semester-I), **Midterm Examination** of **B.Sc. Engg.(CSE)**, January-June/2021, Session: 2018-19

Course Code: CIT-3?5 Course Title: Artificial Intelligence

Full Marks: 15 Duration: 1 hour

1.	What is blind search? How to evaluate an algorithm's performance? Compare search strategies in terms of the four evaluation criteria set.	05
2.	Write the advantage of informed search. How to make heuristic function? Define and illustrate admissible heuristic and consistent heuristic for estimating optimality of A* search algorithm.	05
3.	Define logical agent. Write down a simple algorithm of a generic knowledge-based agent. Given a percept, the agent adds the percept to its knowledge base, asks the knowledge base for the best action, and tells the knowledge base that it has in fact taken that action.	02
4.	What is propositional logic? Drives a propositional logic from Wumpus world is a cave consisting of rooms connected by passageways.	03

Scope of work

h1 = no. of displaced

h2 =

h(n) <= actual

Patuakhali Science and Technology University

Mid Term Examination-2016

Course Code: CIT-315 Course Title: Artificial Intelligence

Full Time: 40 minutes

Full Marks: 15

1. Describe components of a neural network and discuss the similarities of neural network with human brain. 6
2. What does "learning" mean referring to neural nets? 4
3. Differentiate between supervised and unsupervised learning. 2
4. Explain forward propagation and self-organization. 3

Patuakhali Science and Technology University

Department of Computer Science and Information Technology

B.Sc. Engg. (CSE) 5th Semester (Level-3, Semester-I) Final Examination January-June 2021

Course code: CIT-315 Course Title: Artificial Intelligence

Session: 2018-19 Credit hour: 3.00 Full marks: 70 Duration: 3 hours

[Figures in the right margin indicate full marks. Split answering of any question is not recommended]

Answer any 5 of the following questions.

1. (a) What does artificial intelligence mean, AI? 2
   (b) Prove that uniform-cost search and breadth-first search with constant step costs are optimal when used with the GRAPH-SEARCH algorithm. 2+3=5
   (c) Show a state space with constant step costs in which GRAPH-SEARCH using iterative deepening finds a suboptimal solution. Compare the four evaluation criteria set of several uninformed search strategies. 1+4=5
   (d) What is the heuristic function of the informed search strategy? How to minimize the total estimated solution cost using the best-first search, A* search, algorithm. Show the heuristic must be consistent for the optimal solution in the A* search algorithm.

2. (a) Why do we use a local search strategy to address the optimization problem? What are the key advantages of local search algorithms? 2+2=4
   (b) Show how the last configuration of 4-queens on a 4×4 board has fewer conflicts than the first configuration using a local search strategy in where conflicts mean there are no two queens on the same row, column, or diagonal. 2
   (c) What are the reasons and problems, of the hill-climbing algorithm for getting stuck? How to escape these problems using the simulated-annealing search algorithm? 2+3=5
   (d) Illustrate and explain the genetic algorithm using digit strings representation of 8-queen states. 3

3. (a) Define the following terms in your own words. Conditional probability, Marginal probability, Normalization, and Independent probability. 4
   (b) What is Bayes' rule? Compute the patient's probability of having liver disease if they are an alcoholic. "Being an alcoholic" is the test (kind of like a litmus test) for liver disease. Past data tells you that 10% of patients entering your clinic have liver disease and 5% of the clinic's patients are alcoholics. You might also know that among those patients diagnosed with liver disease, 7% are alcoholics. 2+3=5
   (c) Design a naïve Bayes model, a Bayesian classifier based on the dentistry example. 5

4. (a) What is supervised learning? How to learn decision trees using entropy and information gain of attributes. 2+3=5
   (b) What is univariate linear regression? How to minimize the loss using gradient descent for fitting linear regression? 1+2=3
   (c) Define constraint satisfaction problems. Represent the map coloring problem with a constraint graph. 2+2=4
   (d) Define robot. Briefly describe different types of robot hardware. 2

5. (a) Consider the problem of deciding whether a propositional logic sentence is true in a given model. 04
   i. Write a recursive algorithm PL-TRUE?(s,m) that returns true if and only if the sentence s is true in the model m (where m assigns a truth value for every symbol in s).The algorithm should run in time linear in the size of the sentence. (Alternatively, use a version of this function from the online code repository.)
   ii. Give three examples of sentences that can be determined to be true or false in a *partial* model that does not specify a truth value for some of the symbols.
   iii. Show that the truth value (if any) of a sentence in a partial model cannot be determined efficiently in general.
   iv. Modify your PL-TRUE? algorithm so that it can sometimes judge truth from partial models while retaining its recursive structure and linear run time. Give three examples of sentences whose truth in a partial model is *not* detected by your algorithm.

   (b) Which of the following are correct? 2.5
   i. $(A \wedge B) \models (A \Leftrightarrow B)$.
   ii. $A \Leftrightarrow B \models A \vee B$.
   iii. $A \Leftrightarrow B \models \neg A \vee B$.
   iv. $(A \vee B) \wedge (\neg C \vee \neg D \vee E) \models (A \vee B \vee C) \wedge (B \wedge C \wedge D \Rightarrow E)$.
   v. $(A \vee B) \wedge (\neg C \vee \neg D \vee E) \models (A \vee B) \wedge (\neg D \vee E)$.
   vi. $(A \vee B) \wedge \neg(A \Rightarrow B)$ is satisfiable.
   vii. $(A \wedge B) \Rightarrow C \models (A \Rightarrow C) \vee (B \Rightarrow C)$.

viii. $(C \vee (\neg A \wedge \neg B)) \equiv ((A \Rightarrow C) \wedge (B \Rightarrow C))$.

ix. $(A \Leftrightarrow B) \wedge (\neg A \vee B)$ is satisfiable.

x. $(A \Leftrightarrow B) \Leftrightarrow C$ has the same number of models as $(A \Leftrightarrow B)$ for any fixed set of proposition symbols that includes A, B, C.

(c) Consider a vocabulary with the following symbols: 6

Occupation(p, o): Predicate. Person p has occupation o.
Customer (p1, p2): Predicate. Person p1 is a customer of person p2.
Boss(p1, p2): Predicate. Person p1 is a boss of person p2.
Doctor , Surgeon, Lawyer , Actor : Constants denoting occupations.
Emily, Joe: Constants denoting people.

Use these symbols to write the following assertions in first-order logic:

i. Emily is either a surgeon or a lawyer.
ii. Joe is an actor, but he also holds another job.
iii. All surgeons are doctors.
iv. Joe does not have a lawyer (i.e., is not a customer of any lawyer).
v. Emily has a boss who is a lawyer.
vi. There exists a lawyer all of whose customers are doctors.
vii. Every surgeon has a lawyer.

(d) What is a language model? Describe the *N*-gram character models. 1.5

6. (a) In each of the following we give an English sentence and a number of candidate logical expressions. For each of the logical expressions, state whether it (1) correctly expresses the English sentence; (2) is syntactically invalid and therefore meaningless. 6

A. Every cat loves its mother or father.
(i) $\forall x$ Cat (x) $\Rightarrow$ Loves(x,Mother (x) $\vee$ Father (x)).
(ii) $\forall x$ $\neg$Cat(x) $\vee$ Loves(x,Mother (x)) $\vee$ Loves(x,Father (x)).
(iii) $\forall x$ Cat (x) $\wedge$ (Loves(x,Mother (x)) $\vee$ Loves(x,Father (x))).
B. Every dog who loves one of its brothers is happy.
(i) $\forall x$ Dog(x) $\wedge$ ($\exists y$ Brother (y, x) $\wedge$ Loves(x, y)) $\Rightarrow$ Happy(x).
(ii) $\forall x, y$ Dog(x) $\wedge$ Brother (y, x) $\wedge$ Loves(x, y) $\Rightarrow$ Happy(x).
(iii) $\forall x$ Dog(x) $\wedge$ [$\forall y$ Brother (y, x) $\Leftrightarrow$ Loves(x, y)] $\Rightarrow$ Happy(x).
C. No dog bites a child of its owner.
(i) $\forall x$ Dog(x) $\Rightarrow$ $\neg$Bites(x,Child(Owner (x))).
(ii) $\neg\exists x, y$ Dog(x) $\wedge$ Child(y,Owner (x)) $\wedge$ Bites(x, y).
(iii) $\forall x$ Dog(x) $\Rightarrow$ ($\forall y$ Child(y,Owner (x)) $\Rightarrow$ $\neg$Bites(x, y)).
(iv) $\neg\neg\exists x$ Dog(x) $\Rightarrow$ ($\exists y$ Child(y,Owner (x)) $\wedge$ Bites(x, y)).
D. Everyone's zip code within a state has the same first digit.
(i) $\forall x, s, z1$ [State(s) $\wedge$ LivesIn(x, s) $\wedge$ Zip(x)=z1] $\Rightarrow$[$\forall y, z2$ LivesIn(y, s) $\wedge$ Zip(y)=z2 $\Rightarrow$ Digit(1, z1)=Digit(1, z2)].
(ii) $\forall x, s$ [State(s) $\wedge$ LivesIn(x, s) $\wedge$ $\exists z1$ Zip(x)=z1] $\Rightarrow$[$\forall y, z2$ LivesIn(y, s) $\wedge$ Zip(y)=z2 $\wedge$ Digit(1, z1)=Digit(1, z2)].
(iii) $\forall x, y, s$ State(s)$\wedge$LivesIn(x, s)$\wedge$LivesIn(y, s) $\Rightarrow$ Digit(1, Zip(x)=Zip(y)).
(iv) $\forall x, y, s$ State(s) $\wedge$ LivesIn(x, s) $\wedge$ LivesIn(y, s) $\Rightarrow$Digit(1, Zip(x))=Digit(1, Zip(y)).

(b) Translate the following English sentences to FOL. 4

i. Every gardener likes the sun.
ii. You can fool some of the people all of the time.
iii. You can fool all of the people some of the time.
iv. All purple mushrooms are poisonous.
v. No purple mushroom is poisonous.
vi. There are exactly two purple mushrooms.
vii. Clinton is not tall.
viii. All men are not fool.

(c) What is Neural Network? Describe the multilayer perceptron neural networks. 4

Patuakhali Science and Technology University

B.Sc. Engg. (CSE) 5th Semester (Level-3, Semester-I) Final Examination January-June 2020

Course code: CIT-315 Course Title: Artificial Intelligence

Session: 2017-2018 Credit hour: 3.00 Full marks: 70 Duration: 3 hours

[Figures in the right margin indicate full marks. Split answering of any question is not recommended]

Answer any 5 of the following questions.

1. (a) What are the learning outcomes of artificial intelligence? 3
   (b) Define in your own words the following terms: agent, agent program, rationality, autonomy, deterministic, and stochastic. 6
   (c) What is PEAS in specifying the task environment? Illustrate and describe the structure of the model-based reflex agent. 5

2. (a) What is uninformed search? Show that the 8-puzzle states are divided into two disjoint sets, such that no state in one set can be transformed into a state in the other set by any number of moves. 2+2=4
   (b) Prove that uniform-cost search and breadth-first search with constant step costs are optimal when used with the GRAPH-SEARCH algorithm. 3
   (c) Show a state space with constant step costs in which GRAPH-SEARCH using iterative deepening finds a suboptimal solution. Compare the four evaluation criteria set of several uninformed search strategies. 3+4=7

3. (a) What is the heuristic function of informed search strategy? How to minimize the total estimated solution cost using the best-first search, A* search, algorithm? 2+3=5
   (b) Why do we use local search strategy to address optimization problem? Show how the last configuration of 4-queens on a 4 × 4 board has fewer conflicts than the first configuration using local search strategy in where conflicts means there are no two queens on the same row, column, or diagonal. 2+2=4
   (c) What are the problems of the hill-climbing algorithm for getting stuck? How to escape these problems using the simulated-annealing search algorithm? 2+3=5

4. (a) Define in your own words the following terms: decision theory, random variable, conditional probability, and marginal probability. 4
   (b) What is Bayes' rule? Compute the patient's probability of having the liver disease if they are an alcoholic. "Being an alcoholic" is the test (kind of like a litmus test) for liver disease. Past data tells you that 10% of patients entering your clinic have liver disease and 5% of the clinic's patients are alcoholics. You might also know that among those patients diagnosed with liver disease, 7% are alcoholics. 2+3=5
   (c) Design a naive Bayes model, Bayesian classifier based on the dentistry example. 5

5. (a) What is supervised learning? How to learn decision tree using entropy and information gain of attributes? 2+4=6
   (b) Distinguish generalization loss and empirical loss. Show the model selection using error rates of training and validation data for different size decision trees. 2+2=4
   (c) What is univariate linear regression? How to minimize the loss using gradient descent for fitting linear regression? 2+2=4

6. (a) What do artificial neural networks mean? How do the human brains work? 2+2=4
   (b) Illustrate and describe the standard activation functions.
   (c) How to adjust the weights of perceptron in neural network?
   (d) What is the necessity of the k-fold cross-validation technique?

Patuakhali Science and Technology University

B.Sc. Engg. (CSE) 5th Semester Level-3, Semester-I, Final Examination January-June/2018

Course code: CIT-315 Course Title: Artificial Intelligence

Credit hour: 3.00 Full marks: 70 Duration: 3 hours Session: 2015-16

[Figures in the right margin indicate full marks.]

Answer any 5 of the following questions. Split Answering is not recommended.

1. a. Define Artificial Intelligence within 4 different paradigms with examples. 3
   b. What is rationality? Differentiate between human agent and artificial agent in terms of rationality. 1+2
   c. "Do not measure the performance of an agent based on its behaviour. Measure the performance of an agent based on what is wanted in the environment." – justify these statements. 4
   d. Explain the steps that a problem solving agent uses to solve a problem with an example. 4

2. a. What are the components of a solution to a well-defined problem? Explain with an example. 3
   b. Define a game. Differentiate between games and search problems. 1+2
   c. Demonstrate minimax algorithm and alpha-beta pruning with examples. 3+3
   d. Discuss an example of the application of game theory to a real life scenario. 2

3. a. Analyse BFS technique in terms of performance measure. Provide reasons to every measure. 3
   b. "Exponential time or space complexity is very expensive" – justify with an example in terms of time and memory requirements. 3
   c. Compare iterative deepening search (IDS) and breadth first search (BFS) in terms of performance measure. Which one is preferred when the search space is large and the depth of the solution is unknown? Explain with an example. 2+2
   d. Consider the following scenario for 8-puzzle game. Figure 3.d.1 is the initial state and figure 3.d.2 is the goal state. Which of the uninformed search technique would be best suited? Justify your answer in terms of performance measure. 4

8		6
5	4	7
2	3	1

Figure 3.d.1

	1	2
3	4	5
6	7	8

Figure 3.d.2

4. a. How does greedy best first search work? Show using figure 1. What are its properties? 2+2
   b. Demonstrate how greedy best-first search is incomplete using figure 1. 4
   c. Deomnstrate the working principle of A* search to find a path from Oradea to Bucharest (figure 1) 4
   d. Define: Admissible Heuristic, Optimally Efficient. 1+1

5. a. Compare supervised and unsupervised learning. Explain the structure of artificial neuron. 2+2
   b. Why fuzzy logic is used in neural network? Explain the neural network with its classification 2+3
   c. Explain fuzzy inference system. Distinguish between digital computer and neural networks. 3+2

6. a. Explain member function with its features. Distinguish between crisp set and fuzzy set. 3+2
   b. Define defuzzification. Explain the importance of neural network with respect to artificial intelligence. 1+3
   c. Consider the following linguistic variables and membership functions (figure 6.c.1) with respect to fuzzy logic. Calculate the speed of driving in 65% Cloud Cover and 37 F°. 5

Rules	Linguistic-variables
i) If it's sunny and cool drive fast ii) If it's overcast and freezing drive slow	i) Temp: {freezing, cool, warm, hot} (Fig.: i) ii) Cloud Cover: {overcast, partly cloudy, sunny} (Fig.: ii) iii) Speed: {slow, fast} (Fig.:iii)

$f(n) = g(n) + h(n)$

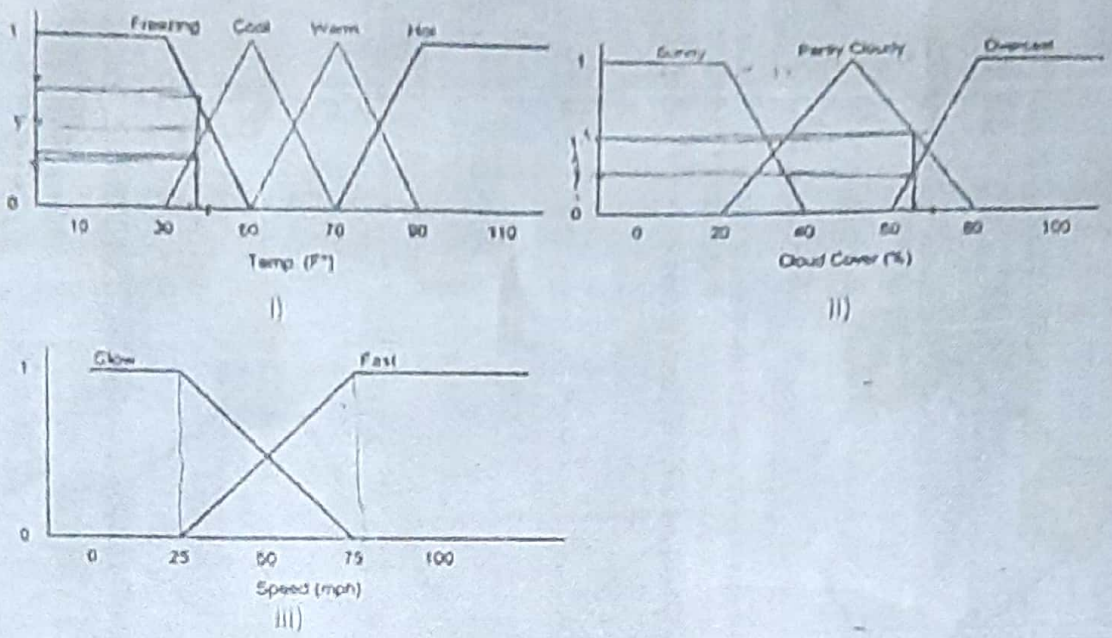
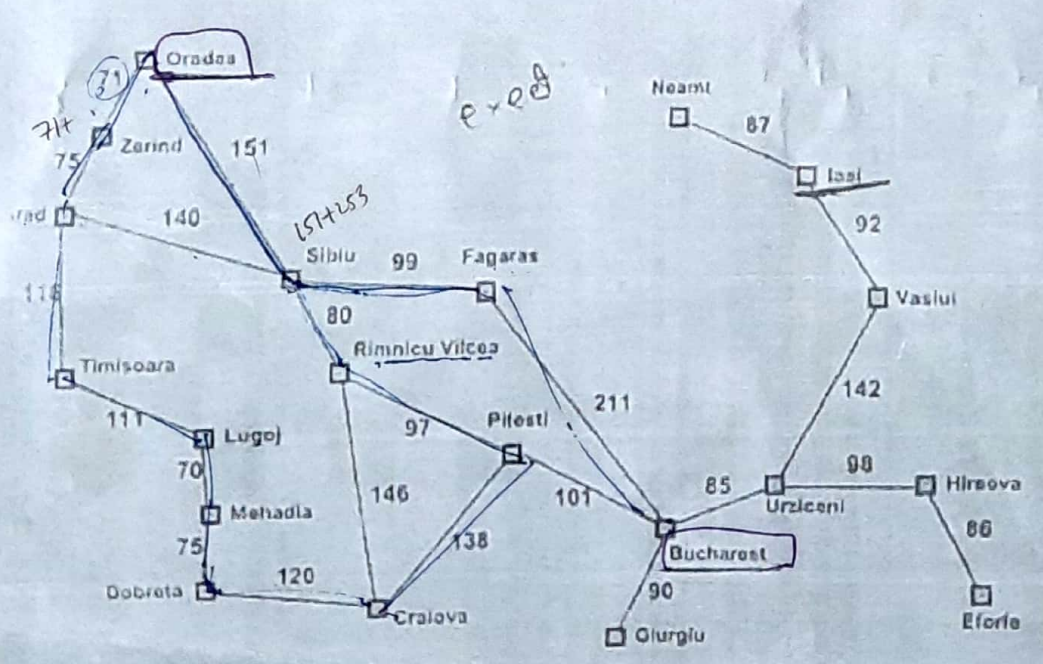


Figure 6.c.1

Romania with step costs in km



Straight-line distance to Bucharest	
Arad	366
Bucharest	0
Craiova	160
Dobreta	242
Eforie	161
Fagaras	178
Giurgiu	77
Hirsova	151
Iasi	226
Lugoj	244
Mehadia	241
Neamt	234
Oradea	380
Pitesti	98
Rimnicu Vilcea	193
Sibiu	253
Timisoara	329
Urziceni	80
Vaslui	199
Zerind	374

Figure 1

Patuakhali Science and Technology University

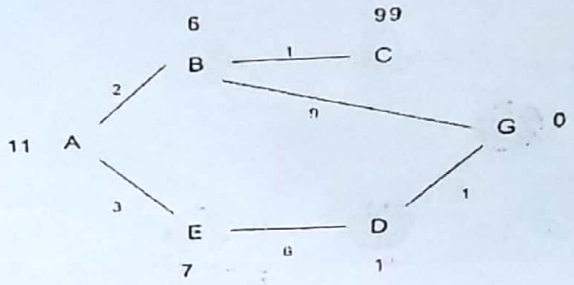
B.Sc. Engg.(CSE) 5th Semester (Level-3 Semester-I) Final Sessional Examination of January-June 2021

Course Code: CIT-315 Course Title: Artificial Intelligence Sessional

Session 2018-19 Credit Hour: 1.5 Full Marks: 70 Duration: 2.50 Hours.

Implement one from each Lab work.

Lab01 Given the below graph, numbers written on edges represents the distance between nodes and numbers written on nodes represent the heuristic value. Implement the A star search algorithm for estimating the cost-effective path from A to G, where A is assigned as source node and G is assigned as the goal node. 10



Implement the Hill-climbing search algorithm for solving the following slide puzzle.

3	8	5
	7	1
2	6	4

(a). Puzzle initial state.

1	2	3
4	5	6
7	8	

(b). Puzzle final state.

Lab02 Implement the Naïve bayes classifier for checking weather to play or not on weather data. 10

Outlook	Temperature	Humidity	Windy	Play
sunny	hot	high	false	no
sunny	hot	high	true	no
overcast	hot	high	false	yes
rainy	mild	high	false	yes
rainy	cool	normal	false	yes
rainy	cool	normal	true	no
overcast	cool	normal	true	yes
sunny	mild	high	false	no
sunny	cool	normal	false	yes
rainy	mild	normal	false	yes
sunny	mild	normal	true	yes
overcast	mild	high	true	yes
overcast	hot	normal	false	yes
rainy	mild	high	true	no

Build a Decision Tree based on the above dataset. Test the new case with your decision tree.

Lab03 See Attachment 10

Lab04 AI project on ChatBot. 20

5. List the given problems which have been solved by you in the sessional classes. 10
6. Viva-voce. 10

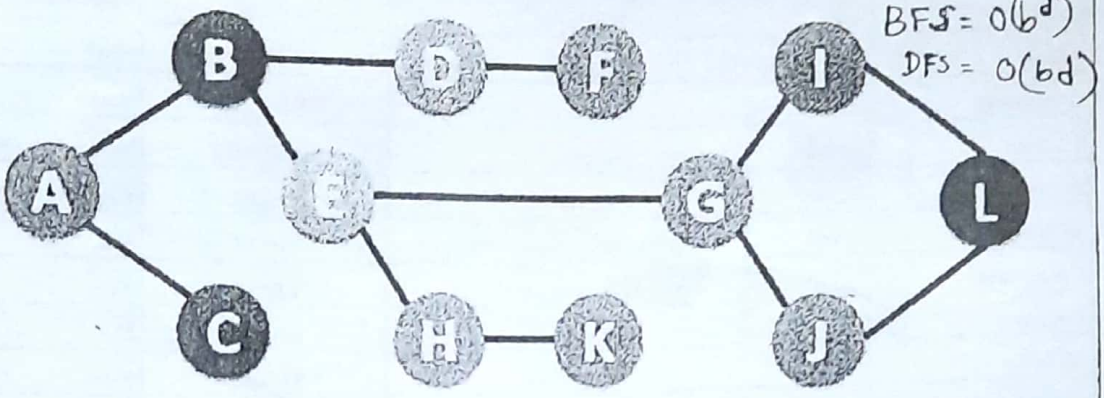
Patuakhali Science and Technology University

B.Sc. Engg.(CSE) 5th Semester (Level-3 Semester-I) Final **Sessional Examination** of January-June 2020

Course Code: CIT-315 Course Title: Artificial Intelligence Sessional

Session 2017-18 Credit Hour: 1.5 Full Marks: 70 Duration: 2.50 Hours.

1.	Implement BFS and DFS algorithms based on the following graph. Show the running time of these two algorithms, which have to satisfy the time complexity properties of them.	10



BFS = $O(b^d)$

DFS = $O(bd)$

2.	The N Queen is the problem of placing N chess queens on an N×N chessboard so that no two queens attack each other. Implement the solution of 8 queen problem from initial state in Fig. 2.1 to goal state in Fig. 2.2 using Hill Climbing algorithm. Queen and empty states can be represented as 1, 0 respectively.	10

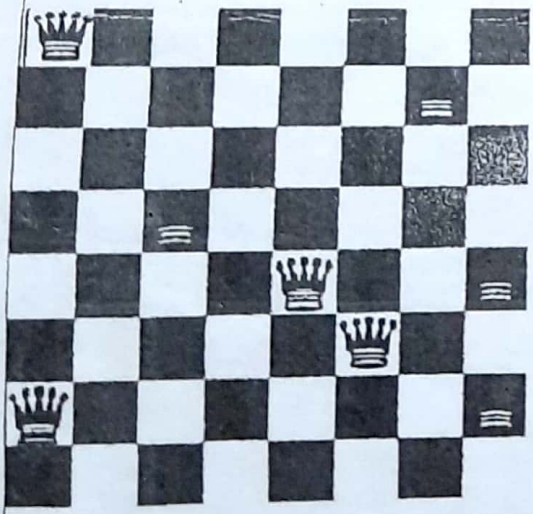


Fig. 2.1: Initial State of 8 Queens

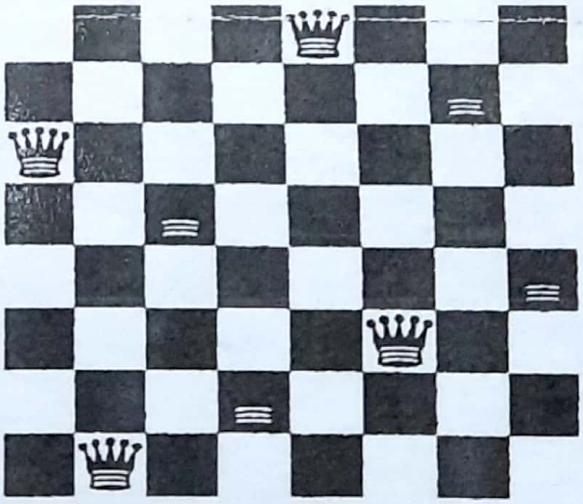
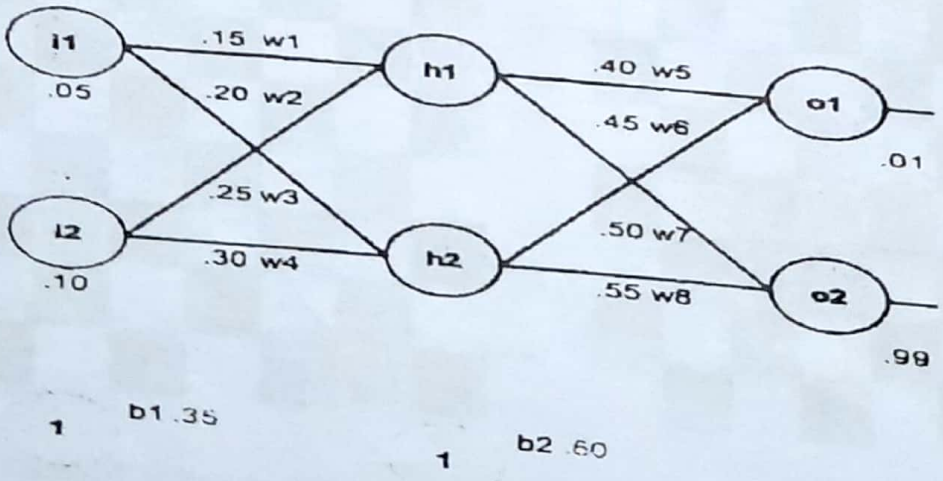


Fig. 2.2: Goal State of 8 Queens

3. Build a Decision Tree based on the following dataset. Test the new case with your Decision Tree.

Attributes				Classes
Outlook	Temperature	Humidity	Windy	Play Golf
Rainy	Hot	High	FALSE	No
Rainy	Hot	High	TRUE	No
Overcast	Hot	High	FALSE	Yes
Sunny	Mild	High	FALSE	Yes
Sunny	Cool	Normal	FALSE	Yes
Sunny	Cool	Normal	TRUE	No
Overcast	Cool	Normal	TRUE	Yes
Rainy	Mild	High	FALSE	No
Rainy	Cool	Normal	FALSE	Yes
Sunny	Mild	Normal	FALSE	Yes
Rainy	Mild	Normal	TRUE	Yes
Overcast	Mild	High	TRUE	Yes
Overcast	Hot	Normal	FALSE	Yes
Sunny	Mild	High	TRUE	No

4. Estimate the weights of the following neural network using backpropagation neural network algorithm. In the network, the initial weights, the biases, and training inputs and outputs are given. 10



5. List the given problems which have been solved by you in the sessional classes.
6. Viva-voce. 10