

Purchase cost (Rs.)	3,00,000
Annual maintenance cost (Rs.)	8,000
Annual energy generated at full load	12,000 kw
Value of energy generated	Rs. 3/ kw-hr
Salvage value (Rs.)	60,000
MARR	8% per year

- b) What do you mean by ecological footprint? How ecological limits can be overcome to attain sustainable development?
5. a) What is the difference between Income statement and cash flow statement? Describe in detail.
- b) List out causes of depreciation. A machine costing of Rs 10,000 is estimated salvage value Rs 500 at the end of 5<sup>th</sup> year. Find depreciation each years by using  
 i) Sinking fund  
 ii) Declining balance  
 iii) SOYD method.
6. a) Explain the ratio analyses in detail of following:  
 i. Debt ratio  
 ii. Current ratio  
 iii. Total Asset turnover ratio  
 iv. Inventory turnover ratio
- b) What are the objectives of financial statements? Prepare the balance sheet from the following information for year ended 30<sup>th</sup> December 2015.
- |                      |        |            |          |
|----------------------|--------|------------|----------|
| Land & Building      | 50,000 | Goodwill   | 10,000   |
| Plant & Machinery    | 30,000 | Creditors  | 20,000   |
| Outstanding expenses | 500    | Loan       | 15,000   |
| Advance Income       | 500    | Investment | 20,000   |
| Debtors              | 10,000 | Reserve    | 6,000    |
| Cash in hand         | 5,000  | Patent     | 5,000    |
| Prepaid Insurance    | 1,000  | Furniture  | 4,000    |
| Inventories          | 25,000 | Capital    | 1,18,000 |
7. Write short notes on: (Any two)
- a) Personal Tax and corporate tax
- b) VAT
- c) Mutually exclusive project and contingent project

### POKHARA UNIVERSITY

Level: Bachelor      Semester – Fall      Year : 2012  
 Programme: BE      Full Marks: 100  
 Course: Artificial Intelligence      Pass Marks: 45  
 Time : 3hrs.

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

*Attempt all the questions.*

- a) Explain Turing test. Machine can be made intelligent artificially but ultimately human make the machines. So who is more intelligent – the artificial machine or the person? Discuss. 4+4

- b) In a crypto-arithmetic puzzle, the variable A, B, C, D, E and F can take values from 1 to 7. The variables must all be different and, when taken as digits, they must satisfy the following sum. Solve the following problem as CSP. 7

$$\begin{array}{r} AB \\ + CD \\ \hline EF \end{array}$$

- a) Explain production systems with the help of 8-puzzle example. 8 2

- b) What are the problems that may arise in hill climbing searching? 4+3  
 How they can be handled? Explain.

OR

- a) You are given two jugs, a 4 liters gallon one and a 3 liters gallon one. Neither have any measuring markers on it. There is a pump that can be used to fill the jugs with water. How can you get exactly 2 liters of water into the 4 liters gallon jug? Solve this problem with state space representation. 8

- b) Explain Min-Max search strategy with example. 7

- a) What is meaning of word *heuristics* in the context of search strategies? What conditions on A\* search is required to guarantee completeness and optimality. 3+4

- b) What are the different dimensions of search strategy? Compare the 4+4

# POKHARA UNIVERSITY

Level: Bachelor	Semester: Spring	Year : 2012
Programme: BE	Full Marks : 100	Pass Marks: 45
Course: Artificial Intelligence		Time : 3hrs.

- BFS and DFS with different dimension.
4. a) The logical operator " $\leftrightarrow$ " is read "if and only if".  $P \leftrightarrow Q$  is defined as being equivalent to  $(P \rightarrow Q) \wedge (Q \rightarrow P)$ . Based on this definition, show that  $P \leftrightarrow Q$  is logically equivalent to  $(P \vee Q) \rightarrow (P \wedge Q)$  using truth table.

- b) Represent the following using first order Logic.

- i) Prasant likes easy courses.
- ii) Science courses are hard.
- iii) All the courses in the computer departments are easy.
- iv) AI is a computer course.

Also, use resolution to answer the question, "What course would Prasant like?"

OR

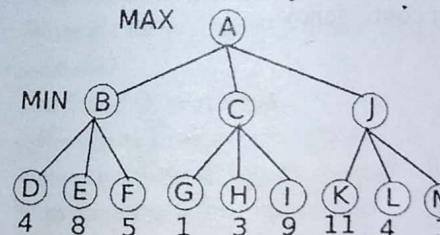
- a) Prove that "jeevan is happy" with the help of following facts expressed in CNF.
- i.  $\neg\text{pass}(X, \text{history}) \vee \neg\text{win}(X, \text{lottery}) \vee \text{happy}(X)$
  - ii.  $\neg\text{study}(X) \vee \text{pass}(Y, Z)$   
 $\neg\text{lucky}(W) \vee \text{pass}(W, U)$
  - iii.  $\neg\text{study}(\text{jeevan})$   
 $\text{lucky}(\text{jeevan})$
  - iv.  $\neg\text{lucky}(U) \vee \text{win}(U, \text{lottery})$
- b) Explain with Example, how first order logic sentences are converted into conjunctive normal form (CNF). 7
5. a) How can you say FOPL extend the expressiveness of PL? 5
- b) Explain the forward and backward representational mapping with diagram. 5
- c) Explain Semantic Network with suitable example. 5
6. a) Explain the basic components of expert system. How can we make expert system knowledge base reusable? 4
- b) What do you mean by learning by analogy? Explain derivational analogy. 3
7. Write short notes on any two: 2
- a) Bayesian Network
  - b) Frames

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) What is AI? Explain various application areas of AI. 7
- b) What is state space search? Give any example of a game which happens to be a problem of state space search and justify your answer properly. 8
2. a) Define Problem formulation. What are the components of problem formulation? Formulate 8-Puzzle problem. 8
- b) Compare Breadth First Search and Depth First Search in terms of time and space complexity, completeness and optimality. 2
3. a) In the figure below, use minimax search with alpha-beta pruning to decide the next move (node) by the MAX player from node A. The numbers indicate utility values. 8



- b) Solve the following crypto arithmetic problem. 7

$$\begin{array}{r}
 \text{SEND} \\
 + \text{MORE} \\
 \hline
 \text{MONEY}
 \end{array}$$

4. a) Assume the following facts:

- i) Bhaskar is a physician
- ii) All physician knows surgery.
- iii) All MBBS are physician.

Prove that "Bhaskar knows surgery" using resolution.

b) Convert the following into WFFx:

- i) Everyone is liked by someone.
- ii) It is 2012.
- iii) Ravi's father is Rani's father.
- iv) All cats have tail and whiskers.

5. a) Define WFF. State and explain inference rules used in FOPL.

b) Contrast and compare Semantic Nets and Frames for knowledge representation.

6. a) What is learning? Explain rote learning and induction learning. Why the process of knowledge acquisition so tedious.

b) Define supervised & unsupervised learning. How perception is used to training the neural network.

7. Write short notes on **any two**:

- a) Turing Test of Intelligence
- b) Tautology, contradiction and contingency
- c) Expert System

## POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Course: Artificial Intelligence

Semester: Fall

Year : 2013

Full Marks: 100

Pass Marks: 45

Time : 3 hrs.

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

*Attempt all the questions.*

a) Do you consider a mobile phone (smartphone) to be intelligent? 8  
Justify your answer.

b) What is 8-puzzle problem? How can you solve a problem using production system? 7 2

a) Trace the constraint satisfaction procedure for solving the following cryptarithmic problem. 7 2

$$\text{SEND} + \text{MORE} = \text{MONEY}$$

b) Compare Depth limited search and breadth first search in terms of time and space complexity, completeness and optimality. 8

a) Using a suitable example, illustrate steps of A\* search. Why A\* search is better than Best first search. 7

b) What are the properties possessed by a good knowledge representation systems? 8

Give P and Q, prove that

$$((P \rightarrow Q) \rightarrow P) \rightarrow P \text{ is tautologous.}$$

a) Convert  $A \leftrightarrow B \leftrightarrow C$  into Conjunctive Normal Form. 7

b) Represent the following sentences in first order logic: 8

i. A person with a dust allergy sneezes.

ii. Every flower likes water.

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

iv. No cake lover throws a cake.

5. a) Contrast and compare Semantic Nets and Frames for knowledge representation. List limitations of these representations. 8

b) State and explain in brief about EBL-system. What are its advantages. 7

6. a) Define a perceptron. Describe a mechanism to train a perceptron.  
 b) Describe with examples how understanding a natural language is difficult at syntactic and semantic levels.
7. Write short notes on: (Any two)  
 a) Informed search Vs Uninformed search.  
 b) Learning by Analogy.  
 c) Baye's theorem.

POKHARA UNIVERSITY

Level: Bachelor Semester: Spring Year : 2013  
 Programme: BE Full Marks: 100  
 Course: Artificial Intelligence Pass Marks: 45  
 Time : 3hrs.

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

*Attempt all the questions.*

- a) Argue against the "Turbine test" as providing a true test of intelligence. 7
- b) A farmer has a goat, a wolf & a cabbage on the west side of a river. He wants to get all of his animals & his cabbage across the river onto the east side. The farmer has a row boat but he only has enough room for himself & one other thing. The wolf will eat the goat if they are left together alone. The goat will eat the cabbage if they are left together alone. How can the farmer get everything on the east side?  
 i. Formulate this puzzle as search  
 ii. Find a solution for this problem. 8 2
- a) Solve the following crypto arithmetic problem. 7 2
- |       |
|-------|
| FORTY |
| TEN   |
| +TEN  |
| <hr/> |
| SIXTY |
- b) "Breadth first search is an implementation of queue whereas Depth first search is an implementation of stack". Verify this statement with suitable example. 8
- a) What is hill climbing search? Explain the problem associated with this search techniques. 8
- b) Explain Alpha-Beta Pruning search. What are the advantages of Alpha-Beta Pruning over Min-max search? 7
- a) Briefly explain the limited expressive capabilities of propositional logic. How does the first order logic extend propositional logic to overcome these limitations? 8

# POKHARA UNIVERSITY

Level: Bachelor      Semester: Fall      Year : 2014  
 Programme: BE      Full Marks: 100  
 Course: Artificial Intelligence      Pass Marks: 45  
 Time : 3hrs.

- b) Assume the following facts:
- Ram likes all kinds of food.
  - Orange are food.
  - Rice is food.
  - Anything anyone eats and is not killed by is food.
  - Krishna eats popcorn and is still alive.
  - Radha eats anything Krishna eats.

Prove that Ram likes popcorn using resolution.

5. a) Define Bayes rule for probabilistic problem. If probability of symptoms on patients is 1/20 and probability of disease known by doctor is 1/45000. Also the probability of symptoms condition to disease is 50%. Now, calculate the probability of disease condition to symptoms using Bayes theorem.
- b) What is semantic network? Explain with suitable example.
6. a) What is machine learning? Explain about learning from examples.
- b) Construct the parse tree for given sentence:  
“Baidh Group disagreed constitution Election”.

Use the following set of Grammers:

$$\begin{array}{ll}
 S \rightarrow NP & VP \\
 NP \rightarrow ART & N \\
 VP \rightarrow V & NP \\
 N \rightarrow \text{Baidh/ constitution/ Election} \\
 V \rightarrow \text{disagree}
 \end{array}$$

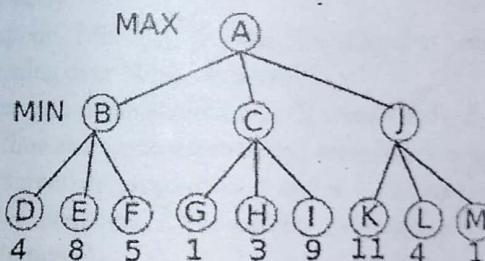
7. Write short notes on: (Any two)
  - Syntax and semantics of a natural language.
  - Procedural knowledge.
  - First order predicate logic.

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

*Attempt all the questions.*

- Define and describe the difference between knowledge, belief, hypothesis and data. 8
- What is the goal of a constraint solver? How are constraints propagated in a constraint satisfaction search? 7.2
- Model the tic-tac-toe problem as a production system. 8.2
- What is A\* search? Explain with its algorithms. 7
- In the figure below, use minimax search with alpha-beta pruning to decide the next move (node) by the MAX player from node A. The numbers indicate utility values. 8



- Compare Breadth First Search and Depth First Search in terms of time and space complexity, completeness and optimality. 7
- Convert (((A AND B) OR (C AND D)) OR E) into Conjunctive Normal Form. Here, OR and AND denote the usual propositional logic operators. 7
- Assume the following facts:
  - Steve only likes easy courses
  - Science courses are hard

- All the courses in the basket weaving department are easy
- BK301 is a basket weaving course

Use resolution to answer the question, "What course would Steve like?"

5. a) Define proposition and a predicate. How does first order logic extend propositional logic to overcome its limitations?
- b) What is a semantic net? For the statement, "The dog bit the mail carrier." Now, represent this statement (Knowledge) using partitioned semantic nets.
6. a) What is learning? Explain rote learning and induction learning. Why the process of knowledge acquisition so tedious.
- b) Why Natural Language understanding is difficult? And also explain its application.
7. Write short notes on: (Any two)
  - a) Statistical reasoning
  - b) Expert System
  - c) Mathematics and Artificial Intelligence.

## POKHARA UNIVERSITY

Level: Bachelor	Semester: Spring	Year : 2014
Programme: BE	Full Marks: 100	Pass Marks: 45
Course: Artificial Intelligence	Time : 3 hrs.	

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

*Attempt all the questions.*

- a) Differentiate between Intelligence and Artificial Intelligence. What are the application areas of AI? State in brief. 8
- b) You are given two jugs, a 4-gallon one and a 3-gallon one. Neither has any measuring marker on it. There is a pump that can be used to fill the jugs with water. How can you get exactly 2 gallons of water into the 4-gallon jug? Solve by production rule system. 7 2
- a) What is state space search? Given any example of a game which happens to be a problem of state space search and justify your answer properly. 8 2
- b) Explain Min-max search. Explain the advantages of Alpha-Beta Pruning over Min-max search? 7
- a) Compare depth limited search and iterative deepening search in terms of time and space complexity, completeness and optimality. 8
- b) Differentiate propositional and a predicate statement. How does first order predicate logic extend propositional logic to overcome its limitations? 7
- a) What are the problems with hill climbing and how can they be solved? Define plateau 7
- b) Represent the following sentences in first order logic:
  - i. Nabin is intelligent than all other students in his class.
  - ii. Neither Sabin nor Kabin is unhappy.
  - iii. Some cats are domestic pets
  - iv. Some turtles are faster than rabbits.
- a) Explain how statistical reasoning aids in inference and reasoning in light of Bayes theorem. 7

b) Differentiate semantic nets and frame based knowledge representation. 8

a) State and explain in brief about EBL-system. What are its advantages 7

b) Explain the different steps involved in the natural language processing (NLP) with suitable block diagram and examples. 8

Write short notes on: (Any two)

2x5

a) Turing test

b) Conceptual dependencies

c) Expert System

## POKHARA UNIVERSITY

Level: Bachelor

Semester: Fall

Year : 2015

Programme: BE

Full Marks: 100

Course: Artificial Intelligence

Pass Marks: 45

Time : 3 hrs.

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

*Attempt all the questions.*

1. a) Define intelligence. With reference to Turning Test can we infer that machine possesses Intelligence, justify your answer. 7

b) Define State Space in problem solving. Using constraint satisfaction problem, solve the following crypto-arithmetic problem.  
CROSS+ROADS=DANGER 8 2

2. a) What are the different types of problems? How can you say that a problem is well defined or not. 8 2

b) In what condition the blind search is preferred? Explain Breadth first search with it's algorithms. 7

3. a) Compare and contrast greedy search and A\* search with a suitable example. 8

b) Define Semantic Network. Draw semantic network of following clauses: 7

Subset\_of(Human, Mammal), Subset\_of(Male, Human),  
Subset\_of(Female, Human), Has\_Mother(Human, Female),  
Member\_of(Mary, Female), Member\_of(John, Male),  
Husband\_of(John, Mary).

4. a) Assume the following facts: 8  

- Steve only likes easy courses
- Science courses are hard
- All the course in the basket weaving department are easy
- BK301 is a basket weaving course

Use resolution to answer the question, "What course would Steve like?"

b) Using Truth Table, Prove the  $P \leftrightarrow Q$  is equivalent to  $(P \rightarrow Q) \wedge (Q \rightarrow P)$  7

- P).
5. a) Define clustering and K-means clustering. Discuss briefly about fuzzy learning and its importance. 7
  - b) How does rule based deduction system work. Compare it with the working of Bayes' theorem. 8
  6. a) What do you understand by neural network? Explain about multilayer perception with proper diagrams. 7
  - b) What is neural network? Define perceptron. How is winning node chosen in Kohonen network, illustrate with following dataset: 8
- $$X = \begin{bmatrix} 0.52 \\ 0.12 \end{bmatrix} \quad W_1 = \begin{bmatrix} 0.27 \\ 0.81 \end{bmatrix} \quad W_2 = \begin{bmatrix} 0.42 \\ 0.70 \end{bmatrix} \quad W_3 = \begin{bmatrix} 0.43 \\ 0.21 \end{bmatrix}$$
- Where,
- X=two dimensional input vector presented in 3-dimentional Kohonen Network
- $$W_i = \text{weight vectors}, i = 1, 2, 3$$
7. Write short notes on: (Any two) 2x5
    - a) Alpha Beta procedure.
    - b) Tautology.
    - c) Frames.

## POKHARA UNIVERSITY

Level: Bachelor	Semester: Spring	Year : 2015
Programme: BE	Full Marks: 100	
Course: Artificial Intelligence	Pass Marks: 45	
	Time : 3 hrs.	

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

*Attempt all the questions.*

1. a) What do you mean by AI? Why it is important? Explain the objectives of AI with examples. 7
- b) Define rational agent? Explain the Learning agent with block diagram. 8
2. a) Define the problem as state space search. Write the various steps involved in solving water-jug problem and give the solution for it. 8 2
- b) Write down the searching steps. Differentiate between uninformed search and informed search. 7
3. a) Explain Minmax algorithm with an example. 7
- b) Michele is a superstar. All superstars are rich. Rich mans have fast cars. Fast cars consume a lot of petrol. Prove that Michele's car consumes a lot of petrol using resolution. 8
4. a) Discuss the importance of knowledge based systems and explain the representation of knowledge. 8
- b) Explain the syntax and semantics for first order predicate logic. 7
5. a) What is Machine learning? Explain the learning by analogy and explanation based learning. 8
- b) Define fuzzy learning. Explain reinforcement learning. 7
6. a) Explain about Back Propagation Algorithm in Neural network. 8

### OR

- Define Perceptron. Illustrate one of the neural network training example.
- b) Why Natural language understanding is difficult? And also explain its application. 7
  7. Write short notes on: (Any two) 2x5
    - a) Adaline Network
    - b) Boltzmann Machine
    - c) Reinforcement Learning.

**POKHARA UNIVERSITY**



Level: Bachelor	Semester: Fall	Year : 2016
Programme: BE	Full Marks: 100	Pass Marks: 45
Course: Artificial Intelligence	Time : 3 hrs.	

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

*Attempt all the questions.*

1. a) Explain the "Rational Thinking" as an aspect of Artificial Intelligence. 8  
List out the various application areas of Artificial Intelligence.
- b) How can an agent be qualified as intelligent? Discuss various types of intelligent agents. 7
2. a) Solve the following Crypto arithmetic problems. 8  

$$\begin{array}{r}
 \text{TWO} \\
 + \text{TWO} \\
 \hline
 \text{FOUR}
 \end{array}$$
2
- b) What do you mean by Heuristics? Compare the Greedy best first search and A\* search in terms of their completeness with suitable example. 7
3. a) The game of NIM is played as follows: 8  
Two players alternatively remove one, two or three coin from a stack initially containing five coin. The player who picks up the last coin loses.
  - i. Draw the full game tree.
  - ii. Show that the player who has the second move can always win.
  - iii. Execute  $\alpha - \beta$  procedure on the game tree. How many terminal nodes are examined?
- b) How can you say that the predicate logic is more expressive than propositional logic? Explain with examples. 7
4. a) Why do we need to represent knowledge? Convert following sentences into FOL sentences. 8
  - i. Everyone loves Ram.

- ii. Not everyone loves Ravana.
  - iii. People protest the politicians they dislike.
  - iv. Politicians can fool some of the people all of the time, all of the people some of the time.
  - v. Not all citizens are loyal to their employers.
- b) When is it useful to use clustering? The following data set contains the scores of two variables on each of seven individuals. Taking 1 and 4 as initial cluster center, apply k-means clustering to group the given data.

Subject	A	B
1	1.0	1.0
2	1.5	2.0
3	3.0	4.0
4	5.0	7.0
5	3.5	5.0
6	4.5	5.0
7	3.5	4.5

5. a) What is machine learning? Explain the learning approach used by Naive Bayes. How is it different from the approach used by neural network?
- b) What do you mean by supervised learning? Explain how support vector machine (SVM) is useful for the classification in non-linearly separable data space.
6. a) Why is Natural Language understanding is difficult? Explain about Morphological Analysis with relevant example.
- b) Explain the basic components of expert system. How can we make expert system knowledge base reusable?
7. Write short notes on: (Any two)
- a) Inference and reasoning
  - b) Deep learning
  - c) Adaline network.

## POKHARA UNIVERSITY

Level: Bachelor  
Programme: BE  
Course: Artificial Intelligence

Semester: Fall

Year : 2017  
Full Marks: 100  
Pass Marks: 45  
Time : 3hrs.

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

*Attempt all the questions.*

- |   |   |
|---|---|
| 1. a) What is Turing test? Explain in detail.   | 7 |
| b) Explain about the importance and applications of Artificial Intelligence.  | 8 |
| 2. a) Discuss Crypto Arithmetic Problem. Solve the following Constraint Satisfaction Problem.<br><br>SEVEN + EIGHT = TWELVE   | 7 |
| b) Informed search is different from uniformed search? Compare and contrast Breadth First Search with Depth First Search.   | 2 |
| 3. a) Explain the limitations of hill climbing and its solution with appropriate examples.  | 7 |
| b) Assume the following facts:<br><br>Lionel Messi is a footballer.<br>Lionel Messi plays for Barcelona.<br>Barcelona is an' A 'Division Spanish Club.<br>All the 'A' Division Spanish Clubs play La Liga.<br>Use Resolution to prove that "Lionel Messi Plays La Liga"               | 8 |
| 4. a) Differentiate between Semantic Network and Frames. Draw semantic network of following clauses<br><br>Subset_of(People, Mammal), Subset_of(Male, People), Subset_of(Female, People), Has_Father(People, Male), Member_of(Ram, Male), Member_of(Sita, Female), Wife_of(Sita, Ram) | 8 |
| b) What is machine learning? Explain in detail the concept of learning by induction with an example.  | 7 |
| 5. a) How does a supervised learning differ from an unsupervised learning?<br>Explain, Nearest Neighbor learning method with example.   | 8 |

- b) Explain the reinforcement learning with example.
- 6. a) How does the perceptron learn its classification tasks? Explain.
- b) Explain the steps involved in Natural Language Processing.
- 7. Write short notes on: (Any two)
  - a) Application of Bayesian networks for reasoning
  - b) MYCN
  - c) Hopfield network

## POKHARA UNIVERSITY

Level: Bachelor  
 Programme: BE  
 Course: Artificial Intelligence

Semester: Spring

Year : 2017  
 Full Marks: 100  
 Pass Marks: 45  
 Time : 3hrs.

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

*Attempt all the questions.*

प्राचीन विद्यालय नेपाल राष्ट्रिय विश्वविद्यालय  
 नेपालको ललितपुर जिल्ला अंग्रेजी  
 NCIT College

- |       |  |     |
|-------|--|-----|
| 1. a) | "If computer passes Turing Test, Computer acts like human". Do you agree? State your answer with reason.   | 7   |
| b)    | Define rational agent? Explain the Learning agent with block diagram.  | 8   |
| 2. a) | Solve the following problem as CSP.<br><br>LOGIC + LOGIC= PROLOG   | 7 2 |
| b)    | Differentiate informed and blind search. How DFS is different from BFS? Compare it with evaluation parameters.   | 8   |
| 3. a) | Write down the disadvantages of hill climbing search procedure.<br>When does simulated annealing algorithm behave like hill climbing?  | 7   |
| b)    | Prove 'Vinod buys a ticket' using resolution considering following premises - Everyone who enters in a theatre has to buy a ticket. Person who doesn't have money can't buy a ticket. Vinod enter a theatre. | 8   |
| 4. a) | Convert the following statement to clause form and discuss the steps.<br>$\forall x[B(x) \rightarrow (\exists y [ Q(x,y) \wedge \neg P(y) ] )]$  | 8   |
| b)    | What do you mean by learning by analogy? Explain derivational analogy.   | 7   |
| 5. a) | "Describe briefly about Nearest Neighbour and Support Vector Machine Learning methods.   | 8   |
| b)    | What is machine learning? In computers, in many cases, rote learning is used. Give five such examples of rote learning.  | 7   |
| 6. a) | What is Artificial Neural Network? Implement a simple logical OR using the perceptron model. What are the different possible threshold values?   | 8   |
| b)    | Explain the steps involved in Natural Language Processing.   | 7   |
| 7.    | Write short notes on: (Any two)  | 2x5 |

- a) Fuzzy Learning
- b) Expert System
- c) Probability and Baye's Theorem

**POKHARA UNIVERSITY**

Level: Bachelor Programme: BE Course: Artificial Intelligence	Semester: Fall	Year : 2018 Full Marks: 100 Pass Marks: 45 Time : 3hrs.
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*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

*Attempt all the questions.*

1. a) What is Artificial Intelligence? Mention the advantages of Artificial Intelligence. 8
- b) What are the criteria for the evaluation of search algorithm? Compare DFS and BFS. 7
2. a) Solve the following problem : SEND+MORE=MONEY 8 2
- b) Write algorithm for A\*. How we can optimize the A\* algorithm? 7
3. a) Represent following statements into predicate logic. 8
  - i) All Hindu are either loyal to Krishna or Shiva.
  - ii) Every gardener like sun.
  - iii) There is exactly two red mushrooms.
  - iv) Every parents are older than their childs.
- b) Define Bayes rule for probabilistic problem. If probability of symptoms on patients is 1/20 and probability of disease known by doctor is 1/45000. Also the probability of symptoms condition to disease is 50%. Now, calculate the probability of disease condition to symptoms using Bayes theorem. 7
4. a) Define deep learning. Explain genetic algorithm. 7
- b) Define PCA. Compare Brain and computer in terms of intelligence, memory etc. 8
5. a) What is an expert system? Explain about its knowledge. 7
- b) Solve the AND function using Hebb network. 8
6. a) Why natural language understanding is difficult? Justify your answer. 7
- b) What do you mean by machine learning? Explain learning by analogy. 8

7. Write short notes on: (Any two)

- a) Kohonen Network
- b) Turing Test
- c) Informed search Vs Uninformed search

POKHARA UNIVERSITY

Level: Bachelor

Semester: Spring

Year : 2018

Programme: BE

Full Marks: 100

Course: Artificial Intelligence

Pass Marks: 45

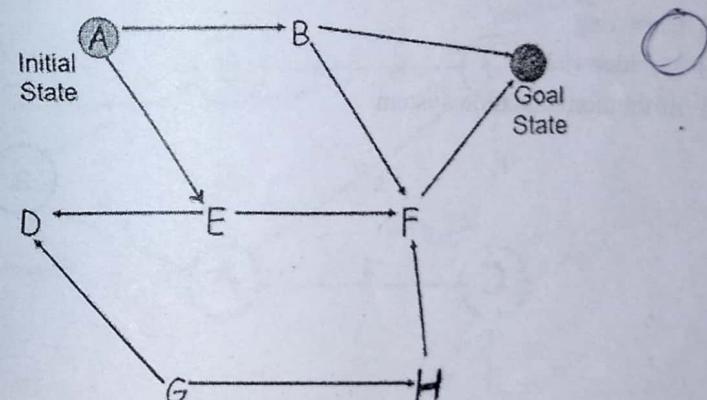
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) What is Artificial Intelligence? Mention the advantages of Artificial Intelligence. 7
- b) Define an artificial agent. Specify the task environment: - performance measure, environment, actuators and sensor for a taxi driver agent and a part-picking robot agent. 8
2. a) What is a state space of a problem? For the given problem represented in graph, where initial state is "A" and goal state is "C", find all the possible state space. 8 2



- b) Define Un-informed search. Explain Iterative deepening search with an example. 7
3. a) How are informed search methods more efficient than uninformed search? Explain the algorithm of A\* search with a suitable example. 8
- b) What is knowledge? Describe the different approached of knowledge representation in brief. 7

4. a) Consider the following facts:

- i. Lucy is a professor
- ii. All professors are people.
- iii. John is the dean.
- iv. Deans are professors.
- v. All professors consider the dean a friend or don't know him.
- vi. Everyone is a friend of someone.
- vii. People only criticize people that are not their friends.
- viii. Lucy criticized John.

Now, using resolution find the answer of "Is John no friend of Lucy?"

b) What is inductive learning? Explain with example.

5. a) Contrast between supervised and unsupervised learning. Describe the K-means learning method with example.

b) What is deep learning? Explain in detail.

6. a) Explain a rule based expert system architecture? Mention its advantages and disadvantages.

b) Why NLP is Difficult? Explain steps in the process of NLP.

7. Write short notes on: (Any Two)

- a) Clustering
- b) Machine vision
- c) Resolution refutation system

## POKHARA UNIVERSITY

Level: Bachelor

Semester: Fall

Year : 2019

Programme: BE

Full Marks: 100

Course: Artificial Intelligence

Pass Marks: 45

Time : 3hrs.

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

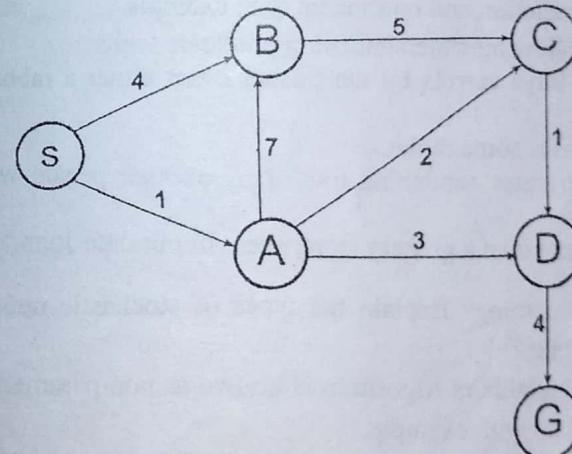
*Attempt all the questions.*

1. a) What is an intelligent agent? Write down the properties of agents. Explain goal based agents & utility based agents in brief. 8

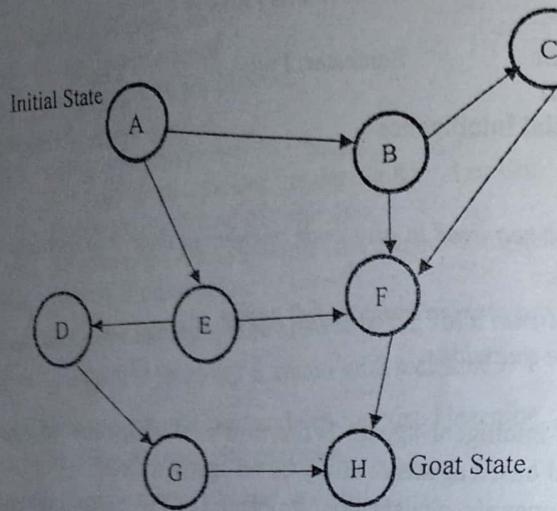
b) What is Constraint Satisfaction Problem (CSP). Solve the crypt-arithmetic problem as CSP. 7 2

$$\begin{array}{r} SEND \\ + MORE \\ \hline MONEY \end{array}$$

2. a) Using A\* search algorithm, find the optimal route from S to G. 8



b) Consider a graph of cities as shown in below figure: 7



- i. Represent state space of this graph using prolog.
- ii. Write a simple search algorithm in prolog to reach to the goal state from initial state.
3. a) What is knowledge representation? Define logical equivalence, tautology, contradiction and contingent with example.  
b) Represent the following statement using predicate logic.
  - i. Anyone who buys carrots by the bushel owns either a rabbit or a grocery store.
  - ii. Every dog chases some rabbit.
  - iii. Someone who hates something owned by another person will not date that person.
  - iv. If Mary does not own a grocery store, she will not date John.
4. a) What is Deep Learning? Explain the types of stochastic neurons of Boltzmann machine?  
b) Why K-nearest Neighbors Algorithm is known as non-parametric lazy algorithm? Explain with example.
5. a) How can we find the right hyperplane in SVM? Using K-means clustering, cluster the following data into two clusters and show each step.  
 $\{2, 4, 10, 12, 3, 20, 30, 11, 25\}$ .
   
b) What is a perceptron? How back propagation algorithm is used in learning and predicting data in machine learning?

6. a) Draw the architecture of Expert System. How forward chaining and backward chaining assist the inference engine of Expert System? 7  
 b) What are the different types of ambiguities that occur in Natural Language Processing? Explain with examples 8
7. Write short notes on: (Any two) 2x5
- a) Fuzzy learning
  - b) Best first search
  - c) Baye's Theorem

POKHARA UNIVERSITY

Level: Bachelor      Semester: Spring      Year : 2019  
Programme: BE      Full Marks: 100  
Course: Artificial Intelligence      Pass Marks: 45  
Time : 3hrs.

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

*Attempt all the questions.*

1. a) What is 'Turing Test' in Artificial Intelligence (AI)? Criticise the performance of the 'Turing Test' to measure the intelligence of the machine. 2+5
- b) Define AI agents. Explain learning agent with block diagram. 3+5
2. a) There are three pegs, labelled A,B and C. There are 3 disks on peg. The top disk has a diameter of 1, the middle disk has a diameter of 2, and the bottom disk has a diameter of 3. There are no disks on peg C. You must move one disk at time and you cannot place a larger disk on top of smaller disk. The problem is to get all of the disks on peg C.
  - i. Find a representation for the states of this problem.
  - ii. Describe all of the operators that might be applied to a state. 8 2
- b) You are given two jugs, a 4- gallon one and a 3 gallon one. Neither has any measuring marker on it. There is a pump that can be used to fill the jugs with water. How can you get exactly 2 gallons of water into the 4-gallon jug? Solve by production rule system. 7 2
3. a) Describe the following features of Genetic Algorithms (GA) – Encoding, Fitness Function, Selection, Crossover and Mutation. Discuss how would you encode TSP problem in GA. 7
- b) Describe the behaviour of iterative deepening search in terms of optimality, completeness, time and space complexity. How does it overcome the drawback of BFS. 8
4. a) Prove "You are not doing strawberry picking" using resolution: 8  
If it is sunny and warm day you will enjoy.  
If it is warm and pleasant day you will do strawberry picking  
If it is raining then no strawberry picking.

If it is raining you will get wet.

It is warm day

It is raining

It is sunny.

- b) What is semantic Net? Represent the following fact using partitioned semantic Nets. "Every teacher has taught a student."

5. a) What is Machine Learning and why is machine learning important? Discuss K-Mean Clustering for following dataset with k=2

Staff ID	Age	Nos. of Leaves
1	21	3
2	39	7
3	43	6
4	58	12
5	32	15

- b) Assume that the following facts are already entered into the PROLOG database:

*father(dasharath,ram). // Dasharath is the father of Ram*

*father(ram,luv).*

father (ram, kush).

*mother(kaushalya, ram). // Kaushalya is the mother of Ram*

*male(dasharath). // Dasharath is a male*

female (kaushalya). // Kaushalya is a female

*parent(X,Y)*:-

*father(X,Y);*

*mother(X,Y). // X is a parent of Y*

6. a) What is Artificial Neural Network? State and discuss backpropagation training algorithm to realize two input XOR gate.  
b) What do you mean by NLP? Construct a parse tree for the sentence "The burglar robbed the apartment".

7. Write short notes on: (Any two)  
a) Reinforcement Learning      b) Deep Learning  
c) Expert System

POKHARA UNIVERSITY

Level: Bachelor

Semester: Fall

Year : 2020

### **Programme:BB**

Full Marks: 100

Course: Artificial Intelligence

Pass Marks: 45

Time : 3 hrs.

*Candidates are required to give their answers in their own words as far as practicable.*

The figures in the margin indicate full marks.

*Attempt all the questions.*

1. a) What is Artificial Intelligence? Discuss the impact of artificial intelligence on society. 7

b) Define Intelligent Agent .Describe different types of intelligent Agents with an example. 8

2. a) What is an 8-puzzle problem? How can you solve a problem using production system? Explain with example. 7 2

b) How is depth limit search efficient with respect to depth first search? Explain with Example. 8

3. a) "A\* search is the combination of best first search & greedy search approach". Explain the statement with suitable example. 7

b) Assume the following facts: 8

  - i) Ravi likes all king of food.
  - ii) Apples and chicken are food
  - iii) Anything anyone eats and is not killed is food
  - iv) Ajay eats peanuts and is still alive
  - v) Rita eats everything that Ajay eats

Prove that **Ravi Likes peanuts** using resolution.

a) What is a semantic net? Represent the following sentences using semantic network. 8

  - Birds are animals.
  - Birds can fly and lay eggs
  - Robin is a bird
  - Ruby is a Robin
  - Ruby owns a nest

3

- b) In a survey, One percent of women over 50 have breast cancer. Ninety percent of women who have breast cancer test positive on mammograms. Eight percent of women will have false positives. From the above statistics, apply Bayes theorem to find the probability that a woman has cancer if she has a positive mammogram result.
5. a) Write down the algorithm for K- means clustering. Explain K- means clustering with a suitable example. 8
- b) What is fuzzy logic? Explain with its applications. 7
6. a) Describe applications of an Expert system? Explain the architecture of Expert System. 8
- b) Explain the steps involved in Natural Language Processing with examples. 7
7. Write short notes on: (Any two) 2x
- a) Artificial Neural Network
- b) Supervised VS Unsupervised
- c) Breadth first search

**POKHARA UNIVERSITY**

Level : Bachelor

Semester – Spring

Year : 2020

Program: BE

Full Marks: 70

Course : Artificial Intelligence

Pass Marks: 31.5

Time : 2 hrs.

*Candidates are required to answer in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

Attempt all the questions.

**Section– A: (5×10 = 50)**

- “Rational Thinking” as an aspect of Artificial Intelligence (AI), explain. Discuss on the various application domains of AI. 5+5
- Mention search criteria. How are informed search methods more efficient than uninformed search? Explain the algorithm of A\* search with a suitable example. 2+2+6
- Discuss Propositional logic with its complexity, validity and tautology. Convert the following sentences into FOPL sentences.
  - No mango is blue.
  - You can fool some of the people all the times
  - Everyone is younger than his father.
  - None of the gardener likes sun.
  - All purple mushrooms are venomous.
- Differentiate Semantic net and Frame. Construct a parse tree for the sentence “*The students took the online examination*”. 4+6
- Differentiate Supervised Learning with Unsupervised learning. Discuss K-means clustering with following dataset with k=2. 4+6

StaffID	Age	NO of leaves
101	20	4
102	29	7
103	35	6
104	22	9
105	28	8

**OR**

Define Neural Network (NN). How back propagation algorithm is used in learning and predicting data in machine learning? Explain with suitable example 2+8

**Section – B: (1×20 = 20)**

- What do you mean by production system? Solve the following Crypto arithmetic problem. 2+8

COCA  
+ COLA  
PEPSI

- b) Introduce statistical reasoning and state Bayes Theorem.

A Scam detector system detects spam emails. Assume that the word "offer" occurs in 80% of the spam messages in your account and in 10% of your non-spam emails (i.e. genuine). 30% of the received emails are considered as a scam. Now, you will receive a new message which contains the word "offer". What is the probability that it is a spam?

## POKHARA UNIVERSITY

Level: Bachelor

Semester: Fall

Year : 2021

Programme: BE

Full Marks: 100

Course: Artificial Intelligence

Pass Marks: 45

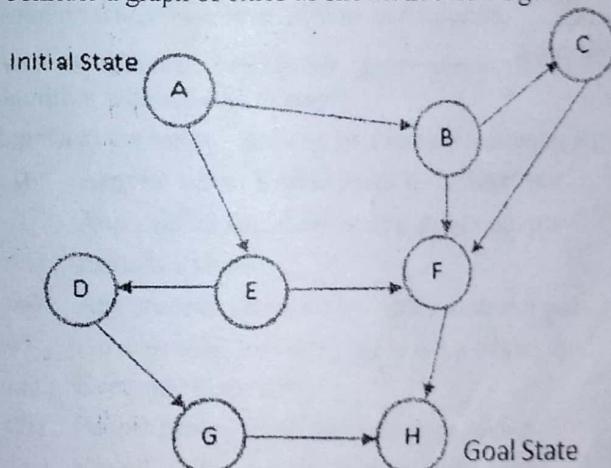
Time : 3hrs.

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

*Attempt all the questions.*

1. a) What is Artificial Intelligence? Discuss the impact of artificial intelligence on society. 7
- b) What is an intelligent agent? Describe the task environment of an autonomous car. 8
2. a) What are the components of a state space search problem formulation? Formulate the 8-queens problem. 7 2
- b) How does the interactive deepening search resolve the problem of depth-first search and breath-first search? Explain with an example. 8
3. a) Consider a graph of cities as shown in below figure: 7



- i. Represent state space of this graph using prolog.
- ii. Write a simple search algorithm in prolog to reach to the goal state from initial state.

- b) Represent the following facts in predicate logic:
- John likes all kind of food.
  - Apple and vegetable are food.
  - Anything anyone eats and not killed is food.
  - Anil eats peanuts and still alive.
  - Harry eats everything that Anil eats.
4. a) Consider the facts given in Q.3 b) using resolution prove that John likes peanuts.
- b) What is machine learning? Discuss the difference between regression, classification and clustering in machine learning.
5. a) Discuss Naive Bayes' algorithm with an example.
- b) How can we find the right hyperplane in SVM? Using K-means clustering, cluster the following data into two clusters and show each step.  
 $\{2, 4, 10, 12, 3, 20, 30, 11, 25\}$ .
6. a) Draw the architecture of Expert System. How forward chaining and backward chaining assist the inference engine of Expert System?  
✓ b) What are the different types of ambiguities that occur in Natural Language Processing? Explain with examples.
7. Write short notes on: (Any two)
- Fuzzy learning
  - Best first search
  - Hopfield Network

## POKHARA UNIVERSITY

Level: Bachelor  
Programme: BE  
Course: Artificial Intelligence

Semester: Spring

Year : 2021  
Full Marks: 100  
Pass Marks: 45  
Time : 3hrs.

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

*Attempt all the questions.*

- a) Do you consider *Text to Speech applications* such as Siri and Alexa as an intelligent agent? Explain with appropriate examples. 7
- b) What do you mean by Total Turing Test? Explain in detail. 8
- a) Your task is to get a robot out of a maze. The robot can turn to face East, West, North or South. Formulate this problem. 7 2
- b) Explain with an example how A-star search can find the optimal solution when there is more than one solution. 8
- a) What is minimax search for game playing? Explain the minmax algorithm with suitable example. 7
- b) Represent the following using first order predication logic. 8
  - Anyone whom Sophie loves is a cricket star.
  - Any student who does not pass does not play.
  - Paras is a student.
  - Any student who does not study does not pass.
  - Anyone who does not play is not a cricket star.
  - Everyone loves Abhi.
  - People protest the politicians they dislike.
  - Not all staffs are loyal to their employers.
- a) Explain Bayesian networks with example. 8
- b) Define and explain supervised and unsupervised learning. Describe briefly the applications of reinforcement learning? 7

5. a) What is Clustering? Explain KNN algorithm with an appropriate example. 8
- b) Explain the explanation based learning with an example. 7
6. a) Define the role of bias in a perceptron. How are weights updated in a single layer perceptron? Explain with example. 7
- b) How can ambiguity occur at phonetic, syntactic, semantic and pragmatic levels of natural language processing? Explain with examples. 8
7. Write short notes on: (Any two) 2x5
- a) Constraint Satisfaction Problem
- b) Expert System
- c) Machine Vision

### POKHARA UNIVERSITY

Level: Bachelor

Semester: Fall

Year : 2022

Programme: BE

Full Marks: 100

Course: Artificial Intelligence

Pass Marks: 45

Time : 3 hrs.

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

**Attempt all the questions.**

1. a) What is Artificial Intelligence? Explain the current trends of AI and its impact on society. 7
- b) Suppose you are traveling from Pokhara to Kathmandu. You have three agents to travel by flight or by bus or by bike. Suppose your preference is to reach Kathmandu as soon as possible. Which agent do you choose? What is type of this agent? Write the details of task environment of the agent you chose. 8
2. a) What are the constraint Satisfaction Problems? Solve the following Crypt-arithmetic Problem. 8

$$\begin{array}{r}
 & \mathbf{B} & \mathbf{A} & \mathbf{S} & \mathbf{E} \\
 + & \mathbf{B} & \mathbf{A} & \mathbf{L} & \mathbf{L} \\
 \hline
 \mathbf{G} & \mathbf{A} & \mathbf{M} & \mathbf{E} & \mathbf{S}
 \end{array}$$

- b) What are the problems of depth first search and breadth first search? How are these problems resolved? Explain with a suitable example 7
3. a) Why is A\* search better than best-first search? Explain with a suitable example. 8
- b) Assume the following facts: 7
- i. John likes all kinds of food.
  - ii. Apple and vegetable are food
  - iii. Anything anyone eats and is not killed is food.
  - iv. Anil eats peanuts and still alive
  - v. Harry eats everything that Anil eats.
  - vi. Anyone who's not killed means, he is alive.

Represent these facts in predicate logic.

4. a) Assume the facts in 3 (b) and use resolution to prove "John likes peanuts."

b) Represent the following facts in prolog

- i. John is parent of Pat.
- ii. Monica is parent of Pat.
- iii. Monica is female.
- iv. John is male.
- v. Bob is parent of John.

Also write the rules in prolog.

vi. To find who is the father of Pat.

vii. To find who is the grand parent of Pat.

5. a) How does support vector machine work? Illustrate with a suitable example.

b) Write down the algorithm for K-means clustering. Explain with a suitable example.

c) Explain how a single a layer perceptron learn logical OR operation. Assume weights  $w_1=-0.4$  and  $w_2=0.3$  and learning rate  $\alpha=0.21$ .

b) What is Expert System? Explain the architecture of expert system in detail.

Write short notes on: (Any two)

- a) Bayesian Network
- b) Learning by analogy
- c) Phases in Natural language processing

## POKHARA UNIVERSITY

Level: Bachelor

Semester: Spring

Year : 2023

Programme: BE

Full Marks: 100

Course: Artificial Intelligence

Pass Marks: 45

Time : 3 hrs.

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

*Attempt all the questions.*

1. a) Justify that "System that think rationally" and "System that act rationally" are the part of artificial intelligence. Explain with examples. 8

b) Define agent function. Differentiate goal-based and utility-based agents with examples. 7

2. a) What is constraint Satisfaction Problem (CSP)? Solve the cryptarithmetic problem as CSP: WRONG+ WRONG= RIGHT 7

b) Why is Hill Climbing called as Local greedy search? Explain the problems in Hill Climbing with appropriate diagrams. 8

3. a) Explain the significance of pruning in game playing algorithms. How does alpha-beta pruning work, and how does it improve the efficiency of the search process in minimax algorithms? 7

b) Represent the following sentences in first order logic and prolog statements: 8

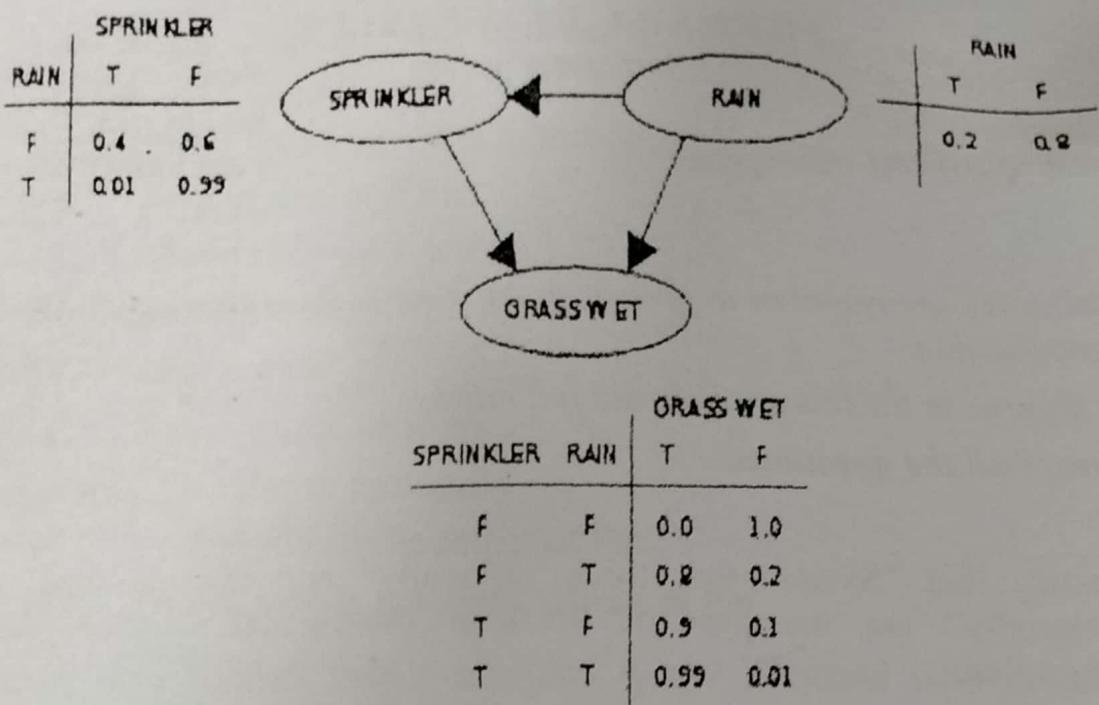
i. All big cars are expensive.

ii. There are some small cars that are expensive.

iii. A car is expensive only if it is big.

iv. All cars have at least one door.

4. a) Why do you need to reason in uncertainty? Consider the given Bayesian network with conditional probability tables and find the probability of the events grass is wet, sprinkler is on and it is raining. 7



- b) Explain the k-means clustering algorithm with step-by-step demonstration on a small dataset, showing how the clusters are formed. 8
5. a) How does the K- Nearest Neighbor work? Illustrate with a suitable example 8
- b) Explain the working principle of support vector machines (SVM) in detail. 7
6. a) What is the role of learning rate in training a neural network? Explain with an example. 8
- b) What is fuzzy logic? Explain with its applications. 7
7. Write short notes on: (Any two) 2x5
- a) Production System
- b) Semantic Nets
- c) Semantic ambiguity in language processing