

Artificial Intelligence



Section-A

1) what is an intelligence.

Intelligence is the ability of a system to calculate, reason, classify, generalize and adapt new situations.

2) Define task.

Task - which requires logic and constraints to function.

3) what is ideal rational agent.

An ideal rational agent is one, which is capable of doing expected actions to maximize its performance measure.

4) Define A* Search.

A* Combines features of uniform cost search with best first.

5) what is Space Complexity.

The maximum number of nodes that are stored in memory.

6) what is fuzzy logic?

Fuzzy logic is a method of reasoning that resembles human reasoning.

7) what is natural language processing (NLP)?

NLP is AI method of communicating with an intelligent systems using a language such as English.

8) Define morphology?

Individual words are analyzed and non-word token like punctuations are separated from words.

9) what are expert Systems.

Expert systems solve the problems that are normally solved by human experts.

10) what is robotics.

Robotics is the engineering science and technology of robots.

11) what are artificial neural networks.

The neural network is to mimic the human ability to adapt to changing circumstances and the current environment.

12) Mention the types of artificial neural network topologies.

- * Artificial neural networks
- * Biological neural networks

Section -B

13) what is AI technique? mention any two application of AI.

In real world, the knowledge has some drawbacks like, it is not well organized and it keeps changing constantly called AI technique.

Application of AI

- * Pattern recognition
- * Gaming.

14) Explain the following agent terminologies.

- i). Behaviour of agent :- It is the action that agent performs after any given sequence of percepts
- ii). Agent Function :- It is a map from the percept Sequence to an action.
- iii). Performance measure of agent :- It is the criteria, which determines how successful an agent is.

15). Differentiate between BFS and DFS

BFS

DFS

*. uses Queue data structure	*. uses Stack data structure
*. If gives optimal solution	*. If does not give optimal Solution
*. It requires more memory	*. It requires less memory.

16) Mention any three advantages and disadvantages of fuzzy logic.

Advantages:-

- *. fuzzy logic is conceptually easy to understand.
- *. fuzzy logic is flexible.
- *. fuzzy logic is based on natural language.

Disadvantages:-

- *. There is no systematic approach to fuzzy system designing.
- *. They are understandable only when simple.
- *. They are suitable for the problems which do not need high accuracy.

17) Mention the difficulties in NLP.

* The same expression shows different things in different contexts.

* No natural language program can complete because new words expressions and meaning can be generated quite freely.

* There are lot of ways to say the same thing.

* There is a great chance of misunderstanding.

18) What are the benefits of expert systems?

* Availability :- They are easily available due to mass production of software.

* Low production cost :- Production cost is reasonable. This makes them affordable.

* Speed :- They offer great speed. They reduce the amount of work an individual puts in.

* Reducing Risk :- They can work in the environment dangerous of humans.

19) What are the components of a robot?

* Power Supply :- The robots are powered by batteries, solar power, hydraulic or pneumatic power source.

* Actuators :- They convert energy into movement.

* Electric motors (AC/DC) :- They are required for rotational movement.

* Pneumatic Air Muscle :- They contract almost 40% when air is sucked in them.

* Muscle wires :- They contract by 5% when electric current is passed through them.

* Piezo Motors and ultrasonic motors :- Best for industrial robots.

Section - C

20) Describe the types of intelligence.

* Linguistic Intelligence :- The ability to speak, recognise and use mechanisms of Phonology, Syntax and Semantics.

Ex:- Narrators, orators

* Musical Intelligence :- The ability to create, communicate with and understand meanings made of sound, pitch and rhythm.

Ex:- musicians, Singers

* Logical mathematical Intelligence :- The ability of use and understand relationship in the absence of action or objects.

Ex:- Mathematicians

* Interpersonal intelligence :- The ability to distinguish among one's own feelings, intentions and motivations.

* Interpersonal intelligence :- The ability to recognise and make distinctions among other people's feelings, beliefs and intention.

Ex:- Mass Communicators, interviewee

21) what are the properties of environment.

* Discrete / Continuous :- If there are a limited number of distinct, clearly defined, states of the environment, the environment is discrete otherwise it is continuous.

* Static / dynamic :- If the environment does not change while an agent is acting, then it is static, otherwise it is dynamic.

* Single agent / multiple agents :- The environment may contain other agents which may be of the same or

different kinds as that of the agent.

* Accessible / Inaccessible: If the agent's sensory apparatus can have access to the complete state of the environment, then the environment is accessible to that agent.

* Observable / partially observable: If it is possible to determine the complete state of the environment at each time point from the percepts it is observable; otherwise it is only partially observable.

22) Explain Travelling Salesman problem in AI.

In this algorithm, the objective is to find a low-cost tour that starts from a city, visits all cities on route exactly once and ends at same starting city.

Start

Find out all $(n-1)$ possible solutions, where n is the total number of cities.

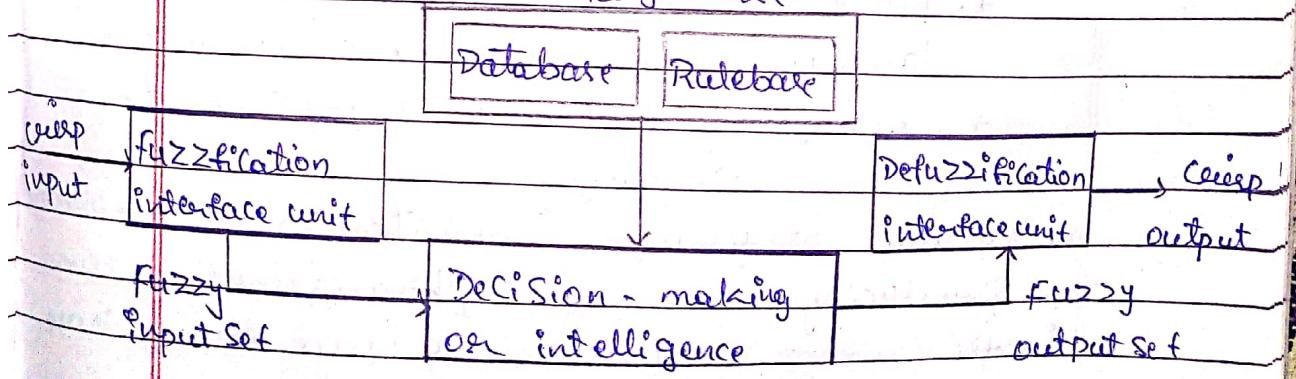
Determine the maximum cost by finding out the cost of each of these $(n-1)$ solutions.

Finally keep the one with the maximum cost.

End.

23) Write and explain the fuzzy logic systems architecture.

Knowledge base



1). Fuzzification Module :- It transforms the System inputs, which are crisp numbers, into fuzzy sets

2). Knowledge Base :- It includes two parts, rulebase and database

3) Inference Engine :- It performs operations on the IF-THEN rules

4) Defuzzification Module :- It converts the fuzzy Set obtained by the inference engine into crisp quantities.

24) Define Content-free grammar with its merit and demerits.

Content free grammar is a set of terminals, set of non-terminals and set of rules. It is the grammar that consists rules with a single symbol on the left hand side of the rewrite rule.

Merit → The simplest style of grammar, therefore widely used one.

Demerits → *

- * They are not highly precise.
- * To bring out high precision, multiple set of grammar need to be prepared.

25) What are the components of NLP?

* Natural language understanding :

- * Mapping the given input in natural language into useful representations.

- * Analyzing different aspects of the language.

* Natural language Generation : It is the process of producing meaningful phrases and sentences in the form of natural language from some

internal representation.

It involves

- * Text planning
- * Sentence planning
- * Text Realization.

26) Explain the Components of expert Systems.

- * Knowledge Base :- It contains domain specific and high quality knowledge. Knowledge is required to exhibit intelligence. The success of any ES mainly depends upon the collection of highly accurate and precise knowledge.
- * Inference Engine :- Use of efficient procedures and rules by the inference engine is essential in deducting a correct & flawless solution.
- * User interface : user interface provides interaction between user of the ES and the ES itself. It is generally natural language processing so as to be used by the user who is well versed in the talk domain.

27) Explain Bayesian Networks (BN)

BNS are Directed Acyclic Graphs. These are the graphical structure used to represent the probabilistic relationship among a set of random variables. These networks are also called belief networks or bayes nets.

Here each node represents a random variable with specific propositions. The edges connecting the nodes represent probabilistic dependencies among those random variables.

Types of discrete nodes are used in BNS are

- * Boolean nodes
- * ordered values
- * Integral values.

Section - D

28) Explain the task classification of AI in detail.

The domain of AI is classified into Formal tasks, Mundane tasks and Expert tasks.

Mundane Tasks	Formal Tasks	Expert Tasks
Perception	* Mathematics	* Engineering
* Computer Vision	* Geometry	* Fault finding
* Speech, voice	* logic	* Manufacturing
	* Integration and Differentiation	* Monitoring

Natural language processing

* Understanding	* Games	Scientific analysis
* Language Generation	* Go	
* Language Translation	* Chess	

Common Sense Reasoning

Planning	Verification	Financial analysis
Robotics	Theorem proving	Medical diagnosis

Creativity.

29) Explain the Search terminologies. Write an algorithm for Simulated annealing.

Search terminologies

* Problem Space :- It is the environment in which the searching is done.

* Problem instance :- It is initial state & goal state.

* Space Complexity :- The maximum number of nodes that are stored in memory.

* Time Complexity :- The maximum number of nodes that are created.

* Depth :- length of the shortest path from initial state to the goal state.

Simulated annealing algorithm

inputs : problem, a problem

schedule, a mapping from time to "temperature"

current \leftarrow MAKE-NODE(INITIAL-STATE[problem])

for $t \leftarrow 1$ to ∞ do

$T \leftarrow$ Schedule[t]

if $T=0$ then return current

next \leftarrow a randomly selected successor of current

$\Delta E \leftarrow$ VALUE[next] - VALUE[current]

if $\Delta E \geq 0$ then current \leftarrow next

else current \leftarrow next only with probability $e^{\Delta E/T}$

30). Explain in detail steps in NLP.

lexical analysis

Syntactic analysis

Semantic analysis

Discourse Integration

Pragmatic analysis

* lexical analysis :- It involves identifying and analysing the structure of words. Lexicon of a language means the collection of words and phrases in a language.

*. Syntactic analysis :- It involves analysis of words in the sentence for grammar and arranging words in a manner that shows the relationship among the words.

*. Semantic analysis :- It draws the exact meaning or the dictionary meaning from the text.

*. Discourse Integration :- The meaning of any sentence depends upon the meaning of the sentence just before it.

*. Pragmatic analysis :- During this, what was said is re-interpreted on what it actually meant.

3). Explain in detail the general steps in the development of expert system.

1). Identify problem domain :-

*. The problem must be suitable for an expert system to solve it.

*. Find the experts in task domain for the ES project.

*. Establish cost effectiveness of the system.

2). Design the System:-

*. Identify the ES technology.

*. Know and establish the degree of integration with the other systems and database.

*. Realize how the concepts can represent the domain knowledge best.

3). Develop the prototype:-

*. from knowledge base

*. Test and Refine the prototype.

4). Develop and Complete the ES :-

*. Document the ES project well.

- * Train the user to use ES.
- * Maintain the System :-
- * Keep the Knowledge base up to date by regular review and update.
- * Cater for new interfaces with other information systems, as those systems evolve.

32) Explain in detail about robot locomotion.

Locomotion is the mechanism that makes a robot capable of moving in its environment. There are various types of locomotions.

i). Legged locomotion :-

* This type of locomotion consumes more power while demonstrating walk, jump, trot, hop, climb up or down, etc

* It comes with the variety of one, two, four and six legs. If a robot has multiple legs then leg coordination is necessary for locomotion.

ii). Wheeled locomotion :- It requires fewer number of motors to accomplish a movement. It is little easy to implement as there are less stability issues in case of more number of wheels. It is power efficient as compared to legged locomotion.

* Standard wheel

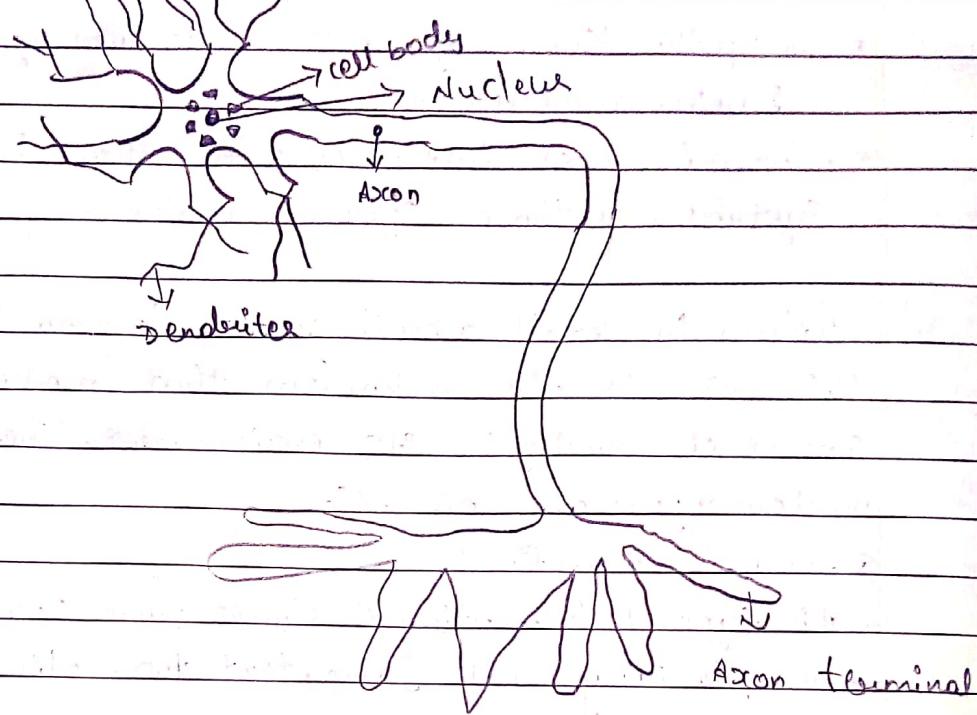
* Caster wheel

* Swedish 45° and Swedish 90° wheels.

* Ball or spherical wheel.

iii). Slip or Skid locomotion :- In this type the vehicles are placed in a tank. The robot is steered by moving the tracks with different speed in the same or opposite direction. It offers stability because of large contact area of tracks and ground.

33) a). write and explain the structure of biological neurons.



*. Synapse:- The electrochemical contact between neurons.

*. Dendrite:- Receiver Signals from other neurons.

*. Soma:- Sums all the incoming Signals.

*. Cell body:- It generates the output neuron Signal.

*. Axon:- When a particular amount of input is received, then the cell fires. It transmits signal through axon to other cells.

b). Explain the types of machine learning in detail.

*. Supervised learning:- It is the process of providing the network with sets of sample inputs and comparing the output with the expected responses. The training continues until the network is able to provide the expected response.

- *. Unsupervised learning :- for the training input vectors, the target output is known, then the training method is called unsupervised learning.
- *. Reinforcement learning :- In this method a teacher assumed to be present, but the right answer is not presented to the network.

34) write and explain the applications of neural network.

- *. Aerospace :- Autopilot aircrafts, aircraft fault detection.
- *. Automotive :- Automobile guidance system.
- *. Electronics :- Code Sequence prediction, IC chip layout, chip failure analysis, machine vision.
- *. Financial :- Real estate appraisal, loan adviser, mortgage screening, Corporate bond rating etc.
- *. Medical :- Cancer Cell analysis, ECG and ECG analysis, prosthetic design, transplant time optimizer.
- *. Speech :- Speech recognition, classification and conversion.
- *. Tele Communications:- image and data compression, automated information Services.
- *. Signal processing:- To process audio signals and filter it appropriately in the hearing aids.
- *. Military :- weapon orientation and steering, target tracking, object discrimination, facial recognition and signal / image identification.