PARSHWANATH CHARITABLE TRUST'S

A.P. SHAH INSTITUTE OF TECHNOLOGY

Department of Computer Science and Engineering

Data Science

UNIT TEST-I

Class: TE **Semester: V** **Subject: AI**

Date:06/09/2023 **Time:10:00am-11:30am** **Max marks: 40**

Note the following instructions

1. **Attempt all questions.**
2. **Draw neat diagrams wherever necessary.**
3. **Write everything in Black ink (no pencil) only.**
4. **Assume data, if missing, with justification.**

Q.N	Questions	MARKS	CO	Blooms Taxonomy Level	PO
Q.1.	**Attempt any two.**				
1.	Determine the role of the Turing test in AI.	[5]	CO1	L2	
2.	How can AI be used in Game Theory?	[5]	CO1	L2	
3.	Relate NLP with AI using examples.	[5]	CO1	L2	
4.	What is the need of ethics in AI?	[5]	CO1	L2	
Q.2.	**Attempt any two**				
1.	Apply alpha beta pruning on following tree shown in figure 1.	[10]	CO3	L3	PO1, PO12
2	Apply greedy best first search on a graph shown in figure 2 to find a path from initial state S to goal state L. Determine the path cost also.	[10]	CO3	L3	PO1, PO12
3	Apply Genetic Algorithm to maximize the function f(x)=x^2-2x, where x=[14, 25, 9, 20]	[10]	CO3	L3	PO1, PO12
Q.3.	**Attempt any one.**				
1.	Draw and describe the architecture of utility based agent. How is it different from a model based agent?	[10]	CO2	L3	PO1, PO12

2.	Determine PEAS description for following agents: ● Self Driving Car ● Autonomous Mars Rover	[10]	CO2	L3	PO1, PO12

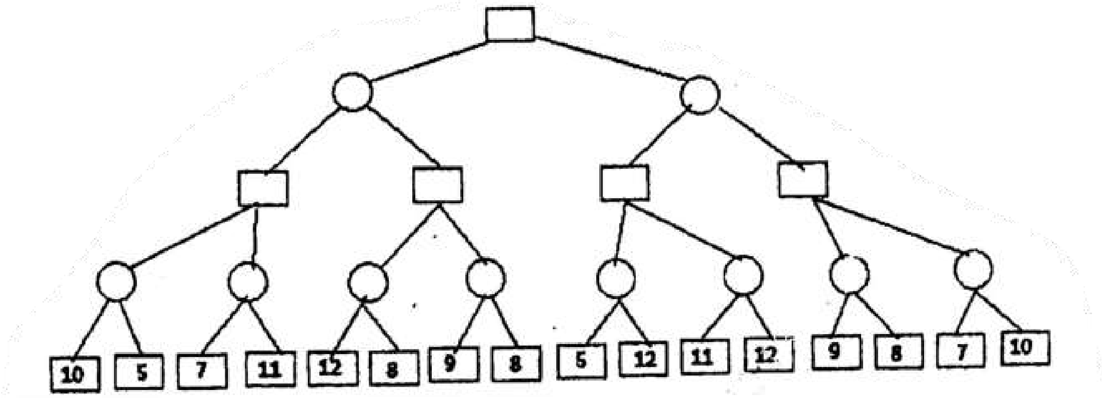


Figure:1

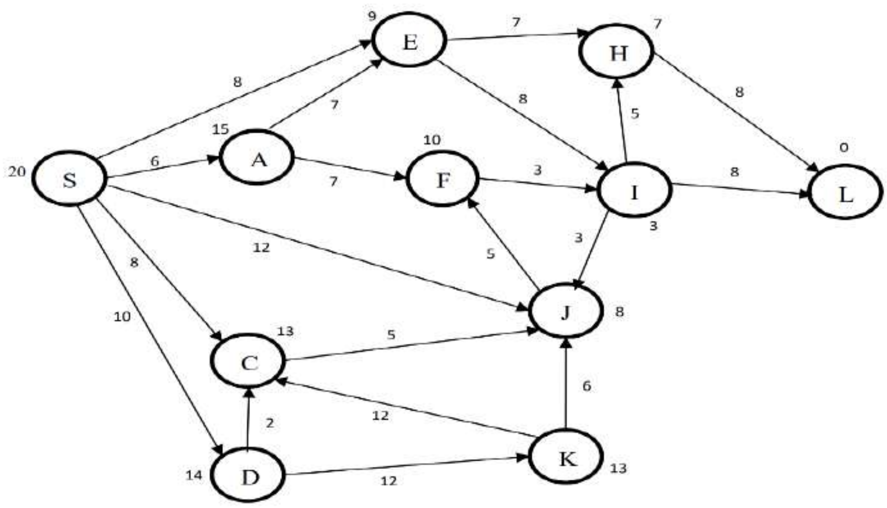


Figure:2

Q. 1 Attempt any two. **10M**

1. Determine the role of the Turing test in AI. 5M

   Ans:

   Turing called the 'Imitation game Test' what we know today as Turing test. Test was proposed in 1950. Turing defined intelligent behavior as something which has the ability to achieve human-level performance in all cognitive tasks, which will be sufficient to fool an interrogator. For the test, Turing requires 3 stakeholders-machine, man, an interrogator.

   The man and the machine will be placed in a room different from that of the interrogator. Latter does not know the identity of either of them, and he is tasked with identifying who is who. He is allowed to ask questions, and based on answers he will have to come to a conclusion. Machine would try to fool the interrogator into believing that it is a human being, and the person in the room will try to help the interrogator determine identities correctly. Turing says that if a machine is able to fool interrogators, it can be said to be intelligent.

2. How can AI be used in Game Theory? 5M

   Ans:

   AI has been applied in various game theory applications. In gaming, AI algorithms are used to design intelligent agents that can play games with human players. For example, AI has been used to develop bots that can play chess, Go, and other board games at a level comparable to human grandmasters.

   AI has also been applied in game theory for strategic decision-making. In business, AI can help identify the optimal pricing strategies, marketing campaigns, and product offerings to maximize profits. AI can also be used to design auction systems that maximize revenue while ensuring fairness for all participants.

3. Relate NLP with AI using examples 5M

   Ans:

   NLP (Natural Language Processing) is an artificial intelligence technique that lets machines process and understand language like humans do using computational linguistics combined with machine learning, deep learning and statistical modeling.

   Through NLP, computers don't just understand meaning, they also understand sentiment and intent. They then learn on the job, storing information and context to strengthen their future responses.

   Examples:

- Language Translation
- Search Engine Results
- Smart Assistants
- Customer Service Automation
- Email Filters
- Survey Analytics
- Chatbots
- Social Media Monitoring
- Text Analytics
- Predictive Text

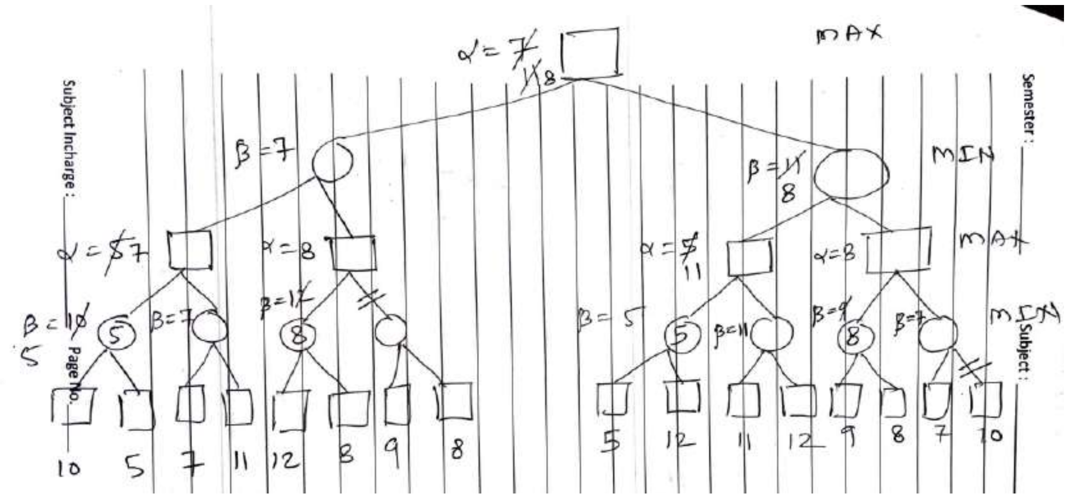
4. What is the need of ethics in AI? 5M

Ans:

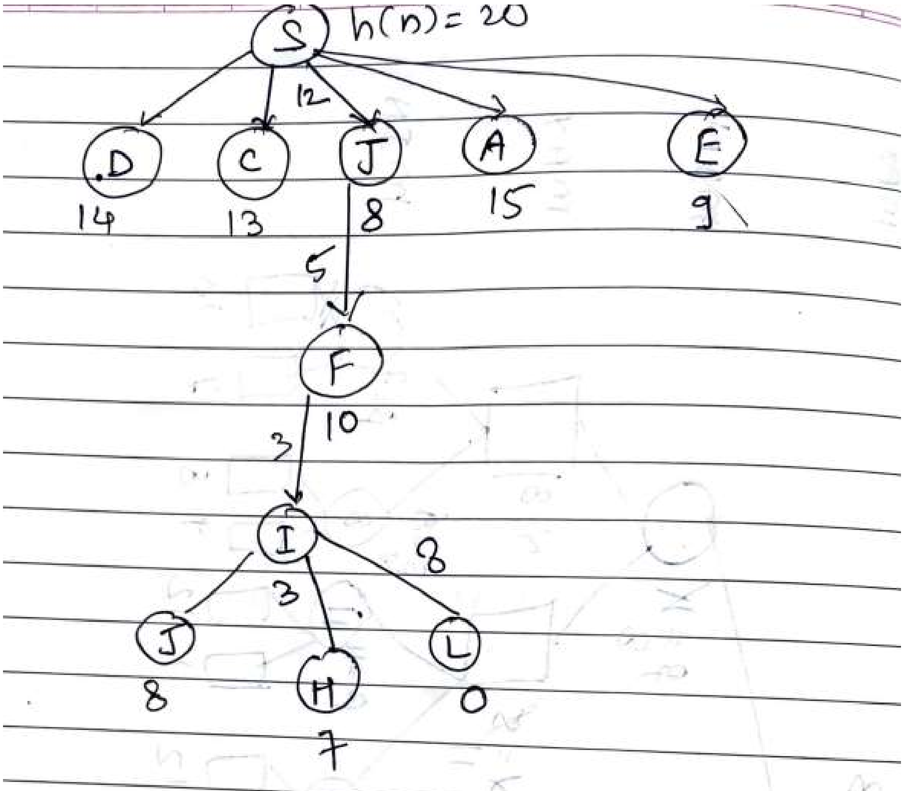
- Explainability. When AI systems go awry, teams need to be able to trace through a complex chain of algorithmic systems and data processes to find out why. Organizations using AI should be able to explain the source data, resulting data, what their algorithms do and why they are doing that. "AI needs to have a strong degree of traceability to ensure that if harms arise, they can be traced back to the cause," said Adam Wisniewski, CTO and co-founder of AI Clearing.
- Responsibility. Society is still sorting out responsibility when decisions made by AI systems have catastrophic consequences, including loss of capital, health or life. The process of addressing accountability for the consequences of AI-based decisions should involve a range of stakeholders, including lawyers, regulators, AI developers, ethics bodies and citizens. One challenge is finding the appropriate balance in cases where an AI system may be safer than the human activity it is duplicating but still causes problems, such as weighing the merits of autonomous driving systems that cause fatalities but far fewer than people do.
- Fairness. In data sets involving personally identifiable information, it is extremely important to ensure that there are no biases in terms of race, gender or ethnicity.
- Misuse. AI algorithms may be used for purposes other than those for which they were created. Wisniewski said these scenarios should be analyzed at the design stage to minimize the risks and introduce safety measures to reduce the adverse effects in such cases.

Q. 2 Attempt any two **20M**

1. Apply alpha beta pruning on following tree shown in figure 1. 10M



2. Apply greedy best first search on a graph shown in figure 2 to find a path from initial state S to goal state L. Determine the path cost also. 10M



Path cost = 12 + 5 + 3 + 8 = 28

3. Apply Genetic Algorithm to maximize the function $f(x)=x^2-2x$, where x=[14, 25, 9, 20] 10M

$f(x) = x^2 - 2x$, $x = [14, 25, 9, 20]$

String No.	Initial Population	X value	f(x) Value	Prob. Count	Expec. count	Actual count
1	01110	14	168	0.14	0.57	1
2	11001	25	575	0.49	1.96	2
3	01001	9	63	0.05	0.21	0
4	10100	20	360	0.30	1.23	1

① $f(x) = 196 - 28 = 168$

② $f(x) = 625 - 50 = 575$

③ $f(x) = 81 - 18 = 63$

④ $f(x) = 400 - 40 = 360$

1166 Total

291.5 AVG

575 MAX

① Probability Count $= \frac{168}{1166} = 0.14$

② $\frac{575}{1166} = 0.49$ ③ $\frac{63}{1166} = 0.05$ ④ $\frac{360}{1166} = 0.30$

① Expected count $= \frac{168}{292} = 0.57$ ② $\frac{575}{292} = 1.96$

③ $\frac{63}{292} = 0.21$ ④ $\frac{360}{292} = 1.23$

Crossover & Mutation

String 2 : 11|001 ⟹ 11110
String 1 : 01|110 ⟹ 01001

String 2 : 11|001 ⟹ 11100
String 4 : 10|100 ⟹ 10001

String No.	Offspring	x-value	f(x)
1	11110	30	840
2	01001	09	63
3	11100	28	728
4	10001	17	255
			840 MAX

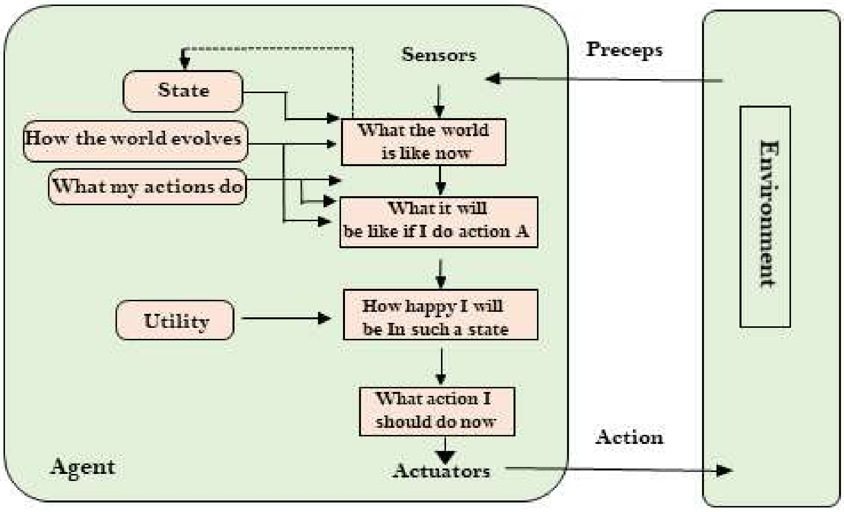
Offspring	After Mutation	x-value	f(x)
11110	11110	30	840
01001	11001	25	575
11100	11100	20	728
10001	11001	25	575
			840 MAX

Q. 3 Attempt any one. **10M**

1. Draw and describe the architecture of utility based agent. How is it different from a model based agent? 10M

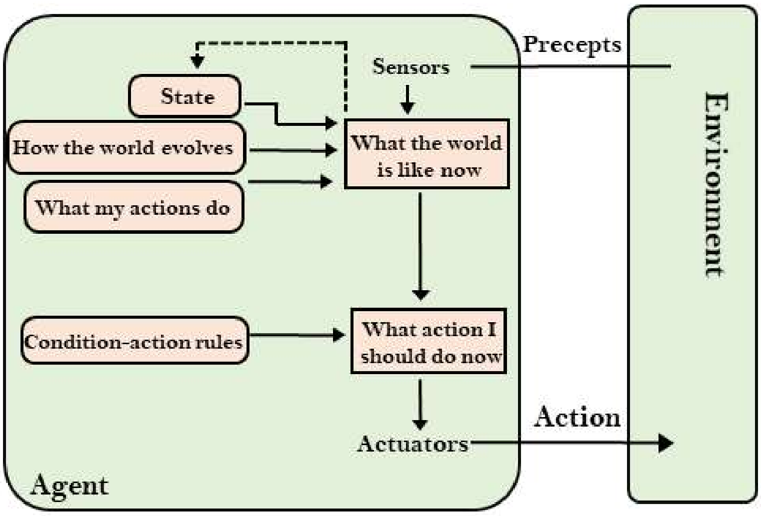
   Ans:

   Utility Based Agent:



- These agents are similar to the goal-based agent but provide an extra component of utility measurement which makes them different by providing a measure of success at a given state.
- Utility-based agent act based not only goals but also the best way to achieve the goal.
- The Utility-based agent is useful when there are multiple possible alternatives, and an agent has to choose in order to perform the best action.
- The utility function maps each state to a real number to check how efficiently each action achieves the goals.

Model based agent



- The Model-based agent can work in a partially observable environment, and track the situation.
- A model-based agent has two important factors:
    - **Model:** It is knowledge about "how things happen in the world," so it is called a Model-based agent.
    - **Internal State:** It is a representation of the current state based on percept history.
- These agents have the model, "which is knowledge of the world" and based on the model they perform actions.
- Updating the agent state requires information about:
    - How the world evolves
    - How the agent's action affects the world.

2. Determine PEAS description for following agents: 10M

- <u>Self Driving Car</u>

  Performance Measure:

  Safety: Automated systems should be able to drive the car safely without dashing anywhere.

Optimum speed: Automated systems should be able to maintain the optimal speed depending upon the surroundings.

Comfortable journey: Automated systems should be able to give a comfortable journey to the end user.

Environment:

Roads: Automated car drivers should be able to drive on any kind of road ranging from city roads to highways.

Traffic conditions: You will find different sorts of traffic conditions for different types of roads.

Actuators:

Steering wheel: used to direct the car in desired directions.

Accelerator gear: To increase or decrease speed of the car.

Sensors:

To take i/p from the environment in car driving example cameras, sonar system etc.

- <u>Autonomous Mars Rover</u>
  Performance Measure::

Terrain explored and reported, samples gathered and analyzed

Environment:

Launch vehicle, lander, Mars

Actuators:

Wheels/legs, sample collection device, analysis devices, radio transmitter

Sensors:

Camera, touch sensors, accelerometers, orientation sensors, wheel/joint encoders, radio receiver