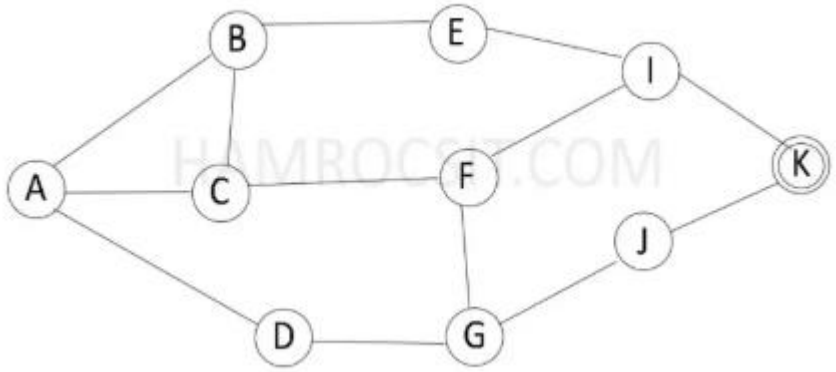
Long questions

1. How are informed searches different from uniform? Given the following state space, illustrate how depth-limited search and iterative deepening search work? Use your own assumption for depth search.



Hence, A is the start and K is the goal.

2. Construct a state space with appropriate heuristics and local costs. Show that Greedy Best First search is not complete for the state space. Also, illustrate A* is complete and guarantees a solution for the same state space.

3. How is the resolution algorithm used in FOPL to infer a conclusion?

Consider the facts;

Anyone whom Pugu loves is a star. Any hero who does not rehearse does not act. Anmol is a hero. Any hero who does not work does not rehearse. Anyone who does not act is not a star. Convert the above into FOPL and use resolution to infer that “If Anmol does not work, then Pugu does not love Anmol”.

4. Write the rules to convert statements in predicate logic into CNF form.

Solve this using resolution

Anyone passing his history exams and winning the lottery is happy. But anyone who studies or is lucky can pass all his exams. John did not study, but John is lucky. Anyone who is lucky wins the lottery. Is John happy?

5. Explain the properties of an intelligent agent. Design and describe the structure of a model-based reflex agent for a weather prediction system, including its sensors, actuators, and internal model.

6. Define artificial intelligence and compare the perspectives of “thinking humanly” and “thinking rationally.” Explain the foundations of AI with suitable examples from modern AI applications.

Short questions:

1. Define an intelligent agent and explain the PEAS framework for an autonomous taxi system.

2. Differentiate between deterministic and stochastic environments with examples from AI systems.

3. Explain the working of iterative deepening search with a simple example.

4. Represent the following sentences into a semantic network

a. Birds are animals.

b. Birds have feathers, fly, and lay eggs.

c. Albatross is a bird.

d. Donald is a bird.

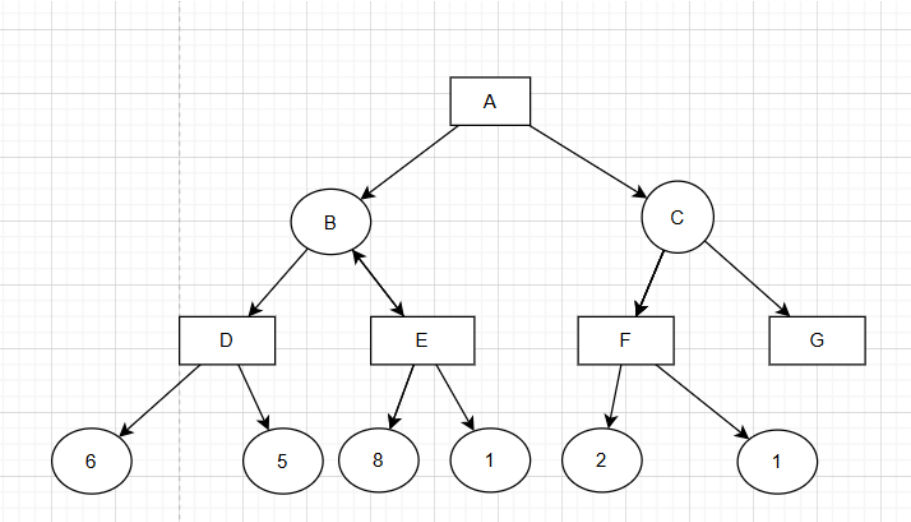
e. Tracy is an albatross.

5. State and explain the role of the utility function in utility-based agents.

6. Explain backward chaining with an example.

7. Explain how Bayesian networks can represent uncertain knowledge.

8. Solve using Alphabeta purning



9. The following table shows the relationship between temperature, wind, and whether people decided to play tennis. The dataset contains two features: **Temperature** (Hot, Mild) and **Wind** (Weak, Strong), and the target variable **PlayTennis** (Yes, No).

ID	Temperature	Wind	PlayTennis
1	Hot	Weak	No

ID	Temperature	Wind	PlayTennis
2	Hot	Strong	No
3	Mild	Weak	Yes
4	Mild	Weak	Yes
5	Hot	Weak	Yes
6	Mild	Strong	Yes
7	Hot	Strong	No
8	Mild	Strong	Yes

Using the **Naïve Bayes classifier**, determine whether **PlayTennis** will be "Yes" or "No" for the following conditions:

- Temperature = **Mild**
- Wind = **Strong**

Show all calculations including:

1. Prior probabilities for each class.
2. Conditional probabilities for each feature given the class.
3. Posterior probability for each class using Naïve Bayes formula.
4. Final classification decision.

1. What is the difference between acting humanely and acting rationally? Give one example for each.

2. Write the properties of a good knowledge representation system.

3. Explain depth-limited search with an example.

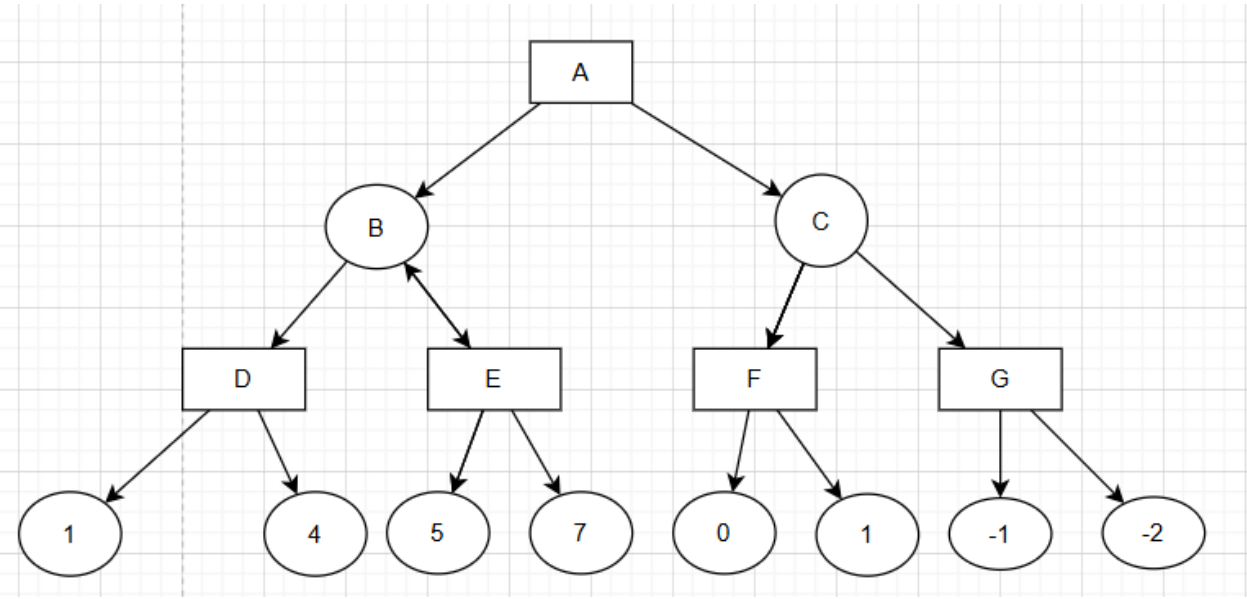
4. Describe the basic structure and working principle of a simple reflex agent.

5. Define prior and posterior probability in Bayesian reasoning with an example.

6. Represent the following sentences in a semantic network

Subash is a student. All students are people. A person has hair. Ram is a player. All players play the game. A game is a physical action. The height of all players is larger than the height of all students. Physical action starts from 7:00 AM and ends at 9:00 AM

7. Solve using Alpha Beta pruning:



8. Explain Forward chaining with an example.

9. The following table shows weather conditions and whether people decided to play tennis. The dataset contains two features: **Outlook** (Sunny, Overcast) and **Humidity** (High, Normal), and the target variable **PlayTennis** (Yes, No).

ID	Outlook	Humidity	PlayTennis
1	Sunny	High	No

ID	Outlook	Humidity	PlayTennis
2	Sunny	High	No
3	Overcast	High	Yes
4	Overcast	High	Yes
5	Sunny	Normal	Yes
6	Sunny	Normal	Yes
7	Overcast	Normal	Yes
8	Sunny	High	No

Question:
Using the **Naïve Bayes classifier**, predict whether **PlayTennis** will be "Yes" or "No" for the following conditions:

- Outlook = **Sunny**
- Humidity = **Normal**

Show all calculations, including:

1. Prior probabilities for each class.
2. Conditional probabilities for each feature given the class.
3. Posterior probability for each class using the Naïve Bayes formula.
4. Final classification decision.