(2½ Hours) [Total Marks: 75]

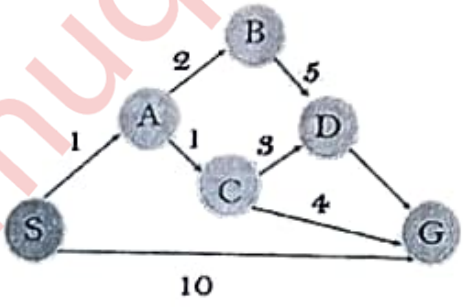
N. B.: (1) All questions are compulsory.
(2) Make suitable assumptions wherever necessary and state the assumptions made.
(3) Answers to the same question must be written together.
(4) Numbers to the right indicate marks.
(5) Draw neat labeled diagrams wherever necessary.
(6) Use of Non-programmable calculator is allowed.

1. **Attempt *any three* of the following:** 15

a. What is AI? List the disciplines that contributed ideas, viewpoints, and techniques to AI.
b. What are the various application areas of AI? Explain.
c. Give the PEAS description for the taxi's task environment.
d. What are Fully observable, partially observable and unobservable task environments? Explain.
e. Explain Model-based reflex agents.
f. What are the components of learning agents? Explain.

2. **Attempt *any three* of the following:** 15

a. What are the various components of a problem? Explain.
b. Explain Depth limited search with an example.
c. What is Hill-climbing search? What are the variants of hill climbing?
d. Given the graph with f(n) and h(n) where S is the Start node and G is the goal node. Apply A* algorithm and find out the best path.




| State | h(n) |
|---|---|
| S | 5 |
| A | 3 |
| B | 4 |
| C | 2 |
| D | 6 |
| G | 0 |

e. How does learning happens in online search? Explain.
f. Write a short note on Simulated Annealing.

3. **Attempt *any three* of the following:** 15

a. Explain the min-max algorithm working with an example.

b. What are the elements used in defining the game formally? Explain.

c. Covert the following into First order logic.
   i. All birds fly.
   ii. Every man respects his parent.
   iii. Some boys play hockey.
   iv. Not all students like both AI and LA.
   v. Only one student failed in SPM subject.

d. Define Wumpus world problem in terms of first order logic.

e. Write alpha beta pruning algorithm.

f. Explain Bayes theorem with an example.

4. **Attempt *any three* of the following:** 15

a. Differentiate between forward and backward chaining.

b. What is first order logic? Explain the different elements used in First order logic.

c. What is Unification? Find the most general unifier (MGU) for the following:
   Find the MGU of A(x, f(g(x)), a) and A(b, y, z)

d. Differentiate between propositional logic and first order Logic.

e. Define Artificial Neural Network. Explain the architecture of it.

f. What are the different types of Artificial Neural Networks. Explain.

5. **Attempt *any three* of the following:** 15

a. Write PDDL description for the following Spare tire problem:
   Consider the problem of changing a flat tire. The goal is to have a good spare tire properly mounted onto the car's axle, where the initial state has a flat tire on the axle and a good spare tire in the trunk. There are just four actions: removing the spare from the trunk, removing the flat tire from the axle, putting the spare on the axle, and leaving the car unattended overnight.
   We assume that the car is parked in a particularly bad neighborhood, so that the effect of leaving it overnight is that the tires disappear.

b. Write a short note on mutual exclusion.

c. Write an algorithm for GraphPlan.

d. Explain state space search for planning.

e. How to solve scheduling problems? Explain.

f. Write a short note on Generative AI.

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