

Time: 3 Hours

Total Marks: 80

Note:

- (i) Each question carries 20 marks
- (ii) Question 1 is compulsory
- (iii) Attempt any three (3) from the remaining questions
- (iv) Assume suitable data wherever required

- Q1. Attempt **any four (4)** questions from the following [20]
- (a) Give PEAS description for a **Personal Assistant in Smartphone**. Characterize its environment.
 - (b) Give the initial state, goal test, successor function, and cost function for an "**N Queens problem**".
 - (c) Draw and explain architecture of Utility Based Agent.
 - (d) Define Turing test and explain its significance in AI.
 - (e) What are universal and existential quantifiers? Illustrate its usage in predicate logic with a suitable example
- Q2 (a) Explain termination conditions in a decision tree learning algorithm with an example for each condition. What are decision rules? How to use it for classifying new samples? [6+2+2]
- (b) Consider the following sentences: [10]
- Anyone passing his history exams and winning a lottery is happy. But anyone who studies or is lucky can pass all his exams. John did not study but he is lucky. Anyone who is lucky wins the lottery.
- Answer "**Is John happy?**" using proof by resolution
- Q3 (a) Design a suitable planning agent for cleaning the kitchen. Give **any 2 STRIPS** style operators that might be used. When designing the operators take into account considerations such as --- Cleaning the stove or refrigerator will get the floor dirty. [10]
- (b) Explain the Bayesian Belief Networks (BBN) with a suitable example. What types of inferences can be drawn from such networks? [10]
- Q4 (a) Define heuristics. Give a suitable heuristic function to solve a **tic-tac-toe** problem in AI. Illustrate its application to any state of a tic-tac-toe problem [6]
- Q4 (b) Write a pseudo code for alpha-beta algorithm. Consider a section of min-max tree shown in Figure 1. Is there any Beta Cut Off possible? If possible, Where and Why? [4+2+4]

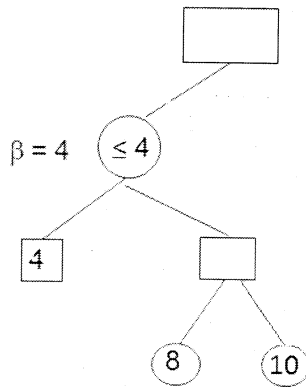


Figure 1

- (c) What are the frustrations that occur in hill climbing algorithm? [4]

- Q5 (a) Explain how Genetic algorithms work with a suitable example? Define the terms chromosome, fitness function, crossover and mutation for the same example. [10]

- (b) Consider the graph given in Figure 2 below. Assume that the initial state is S and the goal state is G. Show how A* Search would create a search tree to find a path from the initial state to the goal state [10]

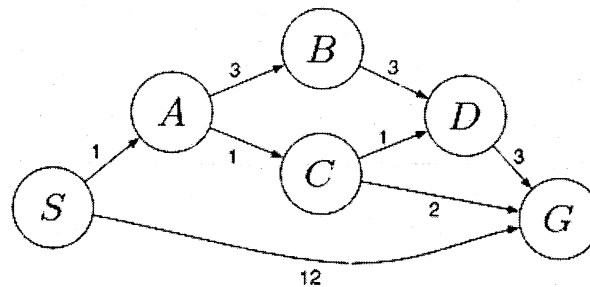


Figure 2

Assuming the straight-line distance as the heuristics function: $h(S)=4$, $h(A)=2$, $h(B)=6$, $h(C)=2$, $h(D)=3$ and $h(G)=0$.

- Q6 Answer any two (2) of the following [20]
- How would you differentiate between Expert System and just an AI program? Draw and illustrate expert systems architecture. Use an example to support your claims.
 - What are steps involved in natural language processing (NLP) of an English sentence? Explain with an example sentence. Briefly explain any one application of NLP
 - Write a short note on simulated annealing.
