



RAJARATA UNIVERSITY OF SRI LANKA
• FACULTY OF APPLIED SCIENCES •

B.Sc. (General) Degree in Information and Communication Technology
Third Year - Semester II Examination – July/ August 2020

ICT 3212 –INTRODUCTION TO INTELLIGENT SYSTEMS

Time: Two (02) hours

- Answer ALL the questions.
- Use the given space in this paper to answer the questions.
- You may use a permitted calculator if needed.

1. Provide **short answers** to the following questions. Each question carries 2 marks. **(30 marks)**

a) What approach out of the four approaches in Artificial Intelligence (AI), that the **Turin test** was designed to provide a satisfactory operational definition?

b) Name **one** major limitation in AI today.

c) What does an "**effectively fully observable environment**" mean?

d) An agent with a table-driven agent program has 10 possible percepts and it receives new percepts once in every 1 second. If lifetime of the agent is 4 seconds, how many entries will be in the lookup table?

e) State the condition to be satisfied for a search algorithm to become "**complete.**"

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f) Under what condition(s) the Breath First Search (BFS) is optimal?

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g) Which algorithm is **optimal** out of **Breath First Search (BFS)** and **Depth Limited Search**?

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h) Under what condition(s) the Depth Limited Search is optimal?

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i) What are the **two** types of **failures** that could be occurred in Depth Limited Search algorithm?

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j) On what situation **Graph-Search** algorithm is more efficient than **Tree-Search** algorithm?

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k) A Breath First Search (BFS) implementation of a search problem has a branching factor of 3. How many nodes will be generated by the root if the goal found at the depth of 3 for the worst cast?

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l) What are the components in the evaluation function of greedy best first search?

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m) What does "**admissible heuristic**" mean?

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n) What is the time complexity of MINMAX algorithm?

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o) What is the time complexity of MINMAX algorithm if alpha-beta pruning is applied for a perfectly ordered game tree?

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2. Answer the following questions considering informed search strategies.

- a) Briefly explain the difference between **uniform-cost-search** and **A* search** algorithms? (5 marks)

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- b) Assume that **Figure 2.1** shows the initial and goal states of 8-puzzle game. Assuming that it is required to solve this problem using A* search algorithm, answer the following questions.

2	8	3
1	6	4
7		5

Initial State

1	2	3
8		4
7	6	5

Goal State

Figure 2.1: Two states of 8-puzzle game

- i. Define a function to obtain the path cost for the problem. (5 marks)

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- ii. Define a suitable heuristic function for the problem. (5 marks)

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- iii. Is your heuristic admissible? Explain your answer. (5 marks)

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- iv. Draw the search tree to find the optimal path employing the A* algorithm. (15 marks)

Optimal Path:

3. Answer the following questions considering adversarial search problems.

- a) How does an adversarial search problem differ from other typical search problems in Artificial Intelligence? (5 marks)

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- b) Briefly explain the limitations of alpha-beta pruning. (5 marks)

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- c) Find MIN-MAX value of each node in the game tree shown in **Figure 3.1**, assuming that MAX plays first. (use the given space to write the MIN-MAX values) (15 marks)

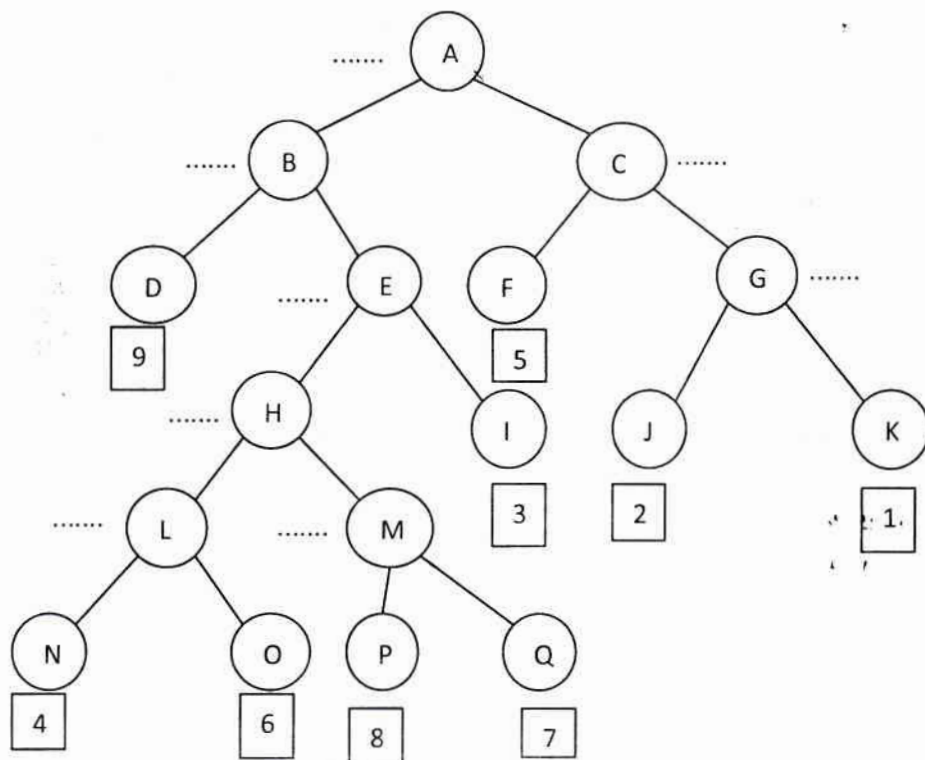


Figure 3.1: A game tree with utility values shown at the leaf nodes.

- i. What nodes will be pruned if alpha-beta pruning is applied to the above game tree with left to right order of examination?

(5 marks)

- ii. If the order of examination of the tree is **reversed**, what nodes will be pruned?

(5 marks)

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