HITEC UNIVERSITY TAXILA

Department of Computer Science
BS Artificial Intelligence Program / BS Cyber Security Program
3rd Semester, Session-2024
Mid Term Examination, Fall 2025

Subject:	CS-312 Artificial Intelligence	**Date:**	Tuesday December 02, 2025
Max Marks:	50	**Max Time:**	120 Minutes

GENERAL INSTRUCTIONS

- Attempt all questions.
- Do not write anything on the question paper.
- All the answers must be correctly numbered as in the question paper.
- Read each question carefully and follow the instructions.

Question #1 **[CO-1 – C2] [SO-1]** **(Marks: 5 × 2 = 10)**

Demonstrate your understanding of fundamental Artificial Intelligence concepts by differentiating between the following with examples

a) Intelligence and Artificial Intelligence.
b) Evolutionary AI and Artificial Super Intelligence.
c) Simple Reflex Agent and Goal-Based Agent.
d) Stack and Queue.
e) Optimality and Near-Optimality.

Question #2 **[CO-1 – C2] [SO-1]** **(Marks: 4 × 2.5 = 10)**

Demonstrate your understanding of basic uninformed search algorithms by answering the following:

a) Explain how Breadth-First Search works. Mention one advantage and one disadvantage.
b) Describe Depth First Search and briefly explain how backtracking happens.
c) What is Depth Limited Search? Why do we use a depth limit?
d) What is Uniform Cost Search, and how is it different from Breadth First Search?

Question #3 **[CO-2 – C2] [SO-1]** **(Marks: 10)**

A city transportation department wants to deploy an AI-based Smart Bus Management System**.** The system should be able to:

- Detect passenger flow at different stops using live video feeds.
- Predict bus overcrowding before it happens.
- Adjust bus schedules dynamically based on traffic patterns.
- Notify drivers and the control center when unsafe driving behavior (e.g., sudden braking, speeding) is detected
- Provide real-time updates to passengers waiting at bus stops

Using your understanding of the PEAS framework, identify and describe the Performance Measure, Environment, Actuators, and Sensors for this Smart Bus Management System. Ensure that your answer clearly connects the PEAS elements to the scenario.

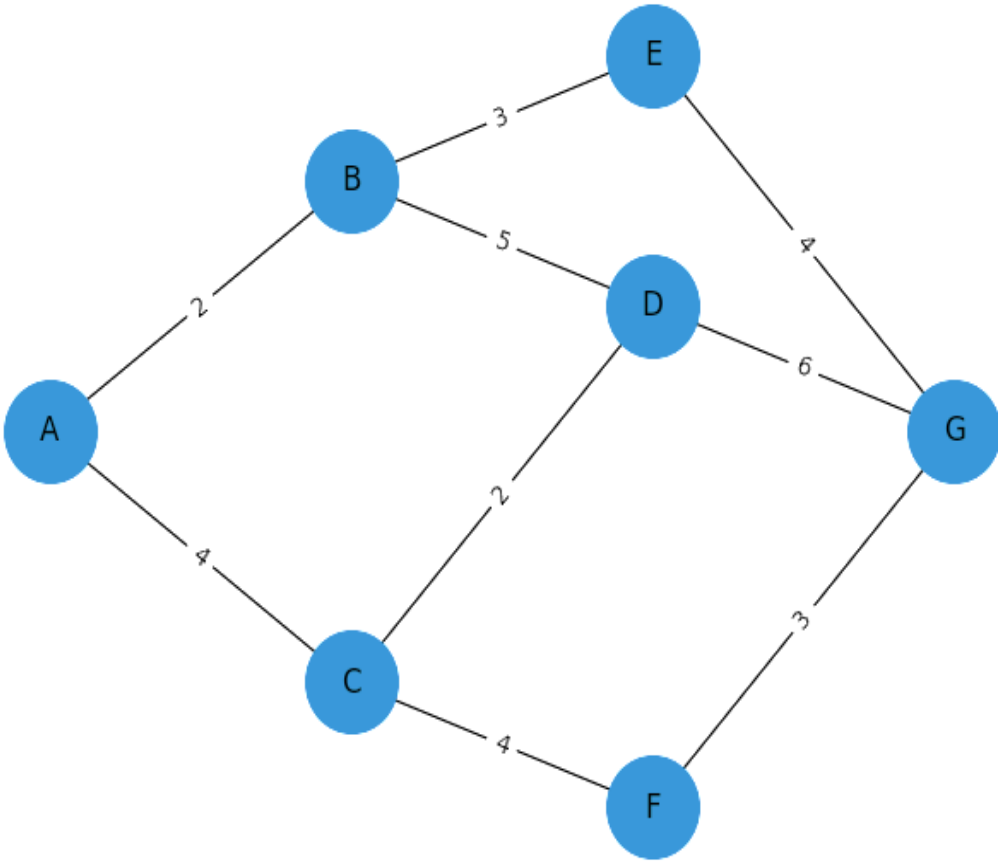
Question #4 **[CO-1 – C2] [SO-1]** **Marks: 2x10 = 20)**

a) Demonstrate your understanding of heuristic-based informed search by answering the following:

1. What is a heuristic function in Artificial Intelligence? How does it guide informed search strategies towards the goal more efficiently than uninformed search?
2. Describe two important characteristics of heuristic search.
3. Mention two real-world applications where heuristic search (such as A*) is commonly used and briefly explain why heuristics are useful there.

b) Consider the following graph, where each edge label represents the step cost. The start node is A and the goal node is G.

Using your understanding of informed search strategies, apply the A* search algorithm on the given graph to find the optimal path from A to G. Clearly show the important steps of A* (values of g(n) h(n), and f(n)=g(n)+h(n)f(n)) and write the final optimal path and its total cost.



Heuristic Knowledge

Node → G	**h(n)**
A → G	10
B → G	8
C → G	5
D → G	7
E → G	3
F → G	6
G → G	0