ASSIGNMENT COVERSHEET

Title:	Assignment
Module:	Artificial Intelligence CP50006E_03-OCT-22_03-FEB-23
Work Setter:	Dr Fateme Dinmohammadi
Assessment:	This homework contributes 50% of the module.
Deadline:	Submission deadline: 23:59, 20th Jan 2023 Submission: On-Line via Blackboard
Feedback method:	Feedback will be via: Comments within 15 working days via Blackboard. Further feedback will be available upon request.

You are reminded of the University rules on Academic Integrity as stated in the student handbook. Examples of conduct regarded as a breach of these regulations include:

- *Plagiarism: reproducing in any work submitted for assessment or review (for example, examination answers, essays, project reports, dissertations or theses) any material derived from work authored by another, without clearly acknowledging the source*
- *Duplication of Material*
- *Conspiring with others to reproduce the work of others without proper acknowledgement, including knowingly permitting work to be copied by another student*
- *Falsification of data/evidence.*
- *Coursework should be all printed and submitted either word or PFD document. Photos or scanning to handwritten work will not be accepted and marked.*

Marking Criteria
This assignment will be marked against a model solution. The marks awarded will be consistent with the scores indicated in the assignment sheet. In general, marks may be lost for work which does not show the full method, include the correct units, or is poorly structured and difficult to follow. If assumptions are required, you should state them and justify why they are appropriate. If the work asks you to comment on the final result you should make an appropriate conclusion.

Important Note: This assignment has four questions (Q1, Q2, Q3 and Q4). An optional programming question is also offered to substitute with either of the four questions for those who wish to do programming.

Question 1 [25 Marks]

Pick an AI technology that has appeared in the news or on TV recently. Write an essay to discuss what technology is about, the benefits of using the technology, and how it's been evolved/changed with AI over the years.

This essay should not exceed 800 words.

Hint: To provide further guidance an exemplar is available in the Blackboard assessment section.

Question 2 [25 Marks]

You will be answering parts (a) to (c) for a "smart home assistant" like Google Home or Amazon's Alexa. These agents listen for keywords (e.g. "Okay, Google"), and when addressed, respond to questions and perform tasks (e.g. adding an item to a list).

(a) Develop a description of the agent using the PEAS analysis, i.e.
- Performance _____ [2 marks]
- Environment _____ [2 marks]
- Actuators _____ [2 marks]
- Sensors _____ [2 marks]

(b) Describe the environment according to the following properties, i.e.,
- Fully versus partially observable ---------- (why?) [2 marks]
- Deterministic versus stochastic ---------- (why?) [2 marks]
- Episodic versus sequential ---------- (why?) [2 marks]
- Static versus dynamic ---------- (why?) [2 marks]
- Discrete versus continuous ---------- (why?) [2 marks]
- Single versus multi-agent ---------- (why?) [2 marks]

(c) Suggest the most appropriate agent design by choosing the most appropriate of the following types: [5 marks]

- Simple reflex agent
- Model-based agent
- Goal-based agent
- Utility-based agent
- Learning agent

Justify your answer with explanations.

Question 3 [25 Marks]

A state space graph is shown in Figure 3.1.

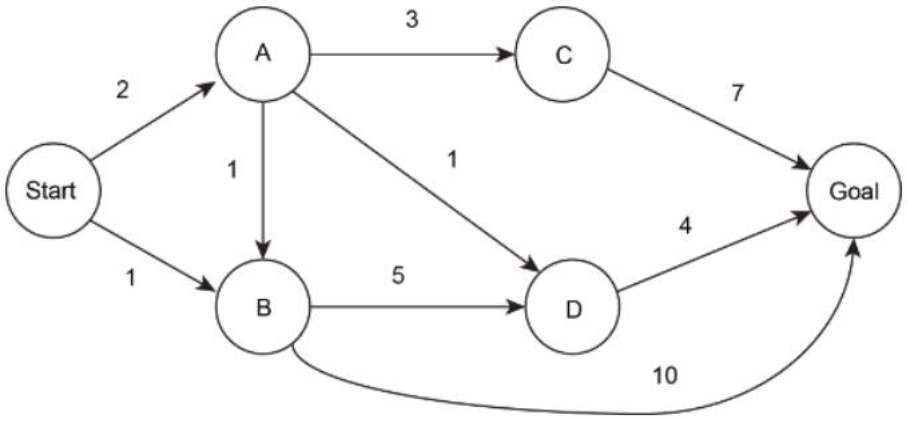

Figure 3.1.

For each of the following AI search strategies, work out the order in which states are expanded, as well as the path returned by graph search.

(a) Depth-First Search. [5 marks]
(b) Breadth-First Search. [5 marks]
(c) Depth limited Search. [Hint: predetermined depth limit = 2] [5 marks]
(d) Iterative deepening Search. [5 marks]
(e) Uniform Cost Search. [5 marks]

Question 4 [25 Marks]

Consider the following joint probability distribution of X and Y shown in Table 4.1.

Table 4.1.

X \ Y	0	1	2
0	$\frac{1}{12}$	$\frac{1}{6}$	$\frac{1}{12}$
1	$\frac{1}{12}$	$\frac{1}{6}$	$\frac{1}{12}$
2	$\frac{1}{6}$	$\frac{1}{12}$	0
3	$\frac{1}{12}$	0	0

Find:

(a) P(X=1, Y=2) [2 marks]

(b) P(X=0, 1≤Y<3) [5 marks]

(c) Find the marginal probability function for X and Y [5 marks]

(d) Give the conditional probability function for X given Y=1 [5 marks]

(e) Are X and Y independent? [8 marks]

Programming Question [SUBSTITUTABLE]

[NOTE: This question can be substituted with either of the above questions if you like. It has same mark as other questions of 25].

A state space graph is shown in Figure S.1. Develop a computer code [in any language] to solve this search problem using Iterative deepening Search (IDS) method. [0: Start State & 6: Goal State]

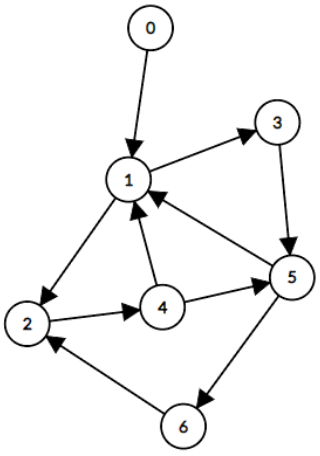

Figure S.1

Note: Any screenshot of your code must include comment that state your name and student ID within the code, such as:

```
1  # student_firstname_surname STUDENT ID: 21xxxxxx
```