AOU
الجامعة العربية المفتوحة
Arab Open University
Faculty of Computer Studies

TM358
Machine learning and artificial intelligence

Midterm Examination (MTA) - Makeup
Summer Fall 2024/2025

Date: 25 /Nov./2024

Number of Exam Pages: 4 (including this cover sheet)	**Time Allowed:** 120 minutes

Instructions:

- Total Marks: **60**
- This exam consists of **2** parts.
- **ALL questions** must be answered in the External Answer booklet.
- Be sure you write your **name and ID** on the External Answer booklet.
- **Calculators** are allowed.

Part -I: Question 1: Choose the best correct answer of all the following: (15 Marks)

1 Backgammon is an example of ..... games

A stochastic
B both of the above
C deterministic
D None of the above

2 ..... knowledge deals with how a question is answered in AI or how a process is performed.

A Procedural
B Declarative
C All of the above
D Instructional

3 .....means "How long does it take to find a solution?"

A Optimality
B Time complexity
C Space complexity
D Completeness

4 ..... are sensors that measure the distance to nearby objects.

A All of the above
B Range finders
C Tactile sensors
D Sonar sensors

5 ..... tend to provide more information, but at the expense of increased power consumption and with a danger of interference when multiple sensors are used at the same time.

A mobile sensors
B Active sensors
C rigid sensors
D Passive sensors

6 .....can be defined as 'the appearance of novel and/or unpredictable, regular patterns or laws arising in systems from interactions between their simple, low-level components'

A emergence
B adaptation
C interaction
D selection

7 ..... is the set of states that we can be in

A goal state
B action set
C state space
D None of the above

8 ..... can be defined as "The ability of some unit to alter its longer-term behavior patterns in response to challenges from its environment"

A interaction
B adaptation
C emergence
D selection

9 ... . algorithms that try to find the best solution and to prove that it is the best.

A exact
B approximate
C combinational optimization
D optimization

10 ..... just like DFS, except never go deeper than some depth d

A BFS
B A*
C Best first
D Depth-limited

Part-II: Answer all of the following questions (45 Marks).

Question 2: (15 marks)

a. Explain the key considerations in deciding between finding the first acceptable solution and searching for the best possible solution.

b. Having the following grid and the depicted agent at location (x=4,y=1) and a target object located at (x=2,y=3)

(row=1,col=1) **1** 	(row=1,col=2) **6** 	(row=1,col=3) **11**	(row=1,col=4) **16** 	(row=1,col=5) **21**	(row=1,col=6) **26**
(row=2,col=1) **2**	(row=2,col=2) **7**	(row=2,col=3) **12** 	(row=2,col=4) **17**	(row=2,col=5) **22**	(row=2,col=6) **27**
(row=3,col=1) **3** 	(row=3,col=2) **8** 	(row=3,col=3) **13**	(row=3,col=4) **18**	(row=3,col=5) **23**	(row=3,col=6) **28**
(row=4,col=1) **4**	(row=4,col=2) **9**	(row=4,col=3) **14**	(row=4,col=4) **19** 	(row=4,col=5) **24**	(row=4,col=6) **29**
(row=5,col=1) **5**	(row=5,col=2) **10**	(row=5,col=3) **15**	(row=5,col=4) **20**	(row=5,col=5) **25**	(row=5,col=6) **30**

Assume that the agent can just go *forward, backward, upward, downward,* using *best first* search write the content of the search agenda at each time step until reaching the target showing the selected directions on the grid.
Assume Euclidian distance from the current location to the target location as the heuristic value.

	Target cell		robot cell		restricted/constrained cell

Question 3: (15 marks)

a. Describe the space and time complexity of breadth-first search (BFS). What factors influence these complexities?

b. Generate the search tree for the stone game(5,3)and use minimax algorithm to calculate the value of each node hence decide the winner for that game assuming rational steps.

Question 4: (15 marks)

a. Explain how block world planning involves decomposing the goal into subgoals.

b. Having the following XO sequence of states a long with their values

O O X X - X - - O	0.500
O O X X - X - X O	0.584
O O X X - X O X O	0.517
O O X X X X O X O	1.000

Assume a learning rate of 0.64 what will be updated values adopting gradient-based state value update with each move.

End of questions