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| Text  Description automatically generated | **Faculty of Environment & Technology** |

**Academic Year : 2021-2022 Examination**

**Module Leader : Litty Tressa George**

**Module Code : UFCFD3-30-1**

**Module Title : Introduction to Artificial Intelligence**

**Duration : 24 hours**

**Examination Opens: 10th May 2022, 14:30**

**Examination Closes: 11th May 2022, 14:30**

**Standard materials required for this examination:**

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| Examination Answer Booklet | | **YES** |
| Multiple Choice Answer Sheet | | **YES** |
| Graph Paper | Type of paper e.g. G3, G14 | G3 |
| Number of sheets per student | 0 |

**Additional materials required for this examination**

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| Details of additional material **supplied by UWE**:  To be collected with Answer Booklet (please delete as appropriate) N/A | |
|  |  |
| Details of approved material **supplied by Student**:  To be collected with Answer Booklet (please delete as appropriate) N/A | |
| University approved Calculator | Yes |
|  |  |
| Candidates permitted to keep Examination Question Paper | Yes |

**INSTRUCTIONS TO CANDIDATES**

**Description**

* This is the exam for UFCFD3-30-1 Introduction to Artificial Intelligence.
* Module Leader: Litty Tressa George
* The **total mark is out of 100** and the duration is **3 hours**.
* This examination is intended to test the following Learning Objectives:
* Identify different types of problem (optimization, modelling, simulation), and state-based models.
* Explain the concept of learning as search and illustrate different individual and population-based search methods.
* Identify different paradigms for representing problems and knowledge (e.g. symbolic, fuzzy, probabilistic, and sub-symbolic), and explain their main features and differences
* Formulate appropriate representations of problems and associated knowledge.
* Use criteria to discriminate, select and apply appropriate paradigms.
* The test consists of a number of questions of different types. Each contains instructions for how to complete it.
* **Instructions**
* This examination contains questionson a mixture of topics.
* **YOU SHOULD ATTEMPT EVERY QUESTION**
* There will be a range of different question types.
* Each question will contain instructions for attempting it.
* You have a maximum of **3 hours** to answer all the questions.

**\*\*Answers should be given in the booklet given to you by the examiner and nowhere else. Answers given by students through any other medium shall not be marked.**

## **A. Question Type – Fill in the blanks 6\*2 = 12 Marks**

The Black box Model of computing views a system as containing a model of some part of the world that we are interested in. Input (from sensors, cameras, keyboard, mouse, or other computers / programs) is fed into the Black box, possibly changing its internal state, and also possibly generating an output, which is fed to the external world (via actuators, display, loudspeakers) or to another computer or program.

From this perspective we can define different types of problems.

**Categorize each of these following descriptions of the problems by identifying the problem type and fill in the blanks with the name of the most appropriate Problem type / its related terminologies. One term can be used more than once if needed.**

**1.** …. ……..are sequences of moves that transform the initial state into the goal state. ………**2** ………… analyzes a situation and develop a strategy for achieving the agent’s goal. Achieving a goal requires finding a sequence of actions that can be expected to have the desired outcome.

**3.** ……………...…………………  problems focus on finding the best value for a given max/min functions according to a set of constraints on the function variables.

In ………**4**. …………...problems, the focus is to build a program or algorithm that utilizes a set of data that enables it to recognize certain patterns. This allows it to reach a conclusion or make a prediction when provided with sufficient information. This is especially useful for solving complex problems using huge amounts of data with high accuracy and minimum costs.

**5**. ….. ………………..refers to the output of an algorithm after it has been trained on a historical dataset and applied to new data when forecasting the likelihood of a particular outcome. The algorithm will generate probable values for an unknown variable for each record in the new data, allowing the model builder to identify what that value will most likely be.

The key advantage of ……..**6**. ……over data-driven methods is that it allows us to forecast things that have never happened before and to run scenarios outside of historical bounds — including crisis scenarios. As long as our theory is sound, we can make startling accurate predictions about states of the world we have never seen before. we already know what to do because we have already test-driven our decisions in the virtual world.

**B. Question Type: Match the following 10\* 2= 20 MARKS**

**Match the following problem scenarios appropriately by choosing the matching problem type from options given below .**

**\*\*Some options may be used more than once.**

[ a). optimization b). estimation c). prediction d). modelling e). manipulation f). guiding g). search h). planning i). cloud-computing j). simulation]

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| --- | --- | --- |
| SL.No | Example Problem Scenario | Problem type? |
|  | We have 1,000 patients who need to be screened for diabetes. The task is to prioritize high-risk patients for screenings first, and de-prioritize low-risk patients to be screened later. Model considers patient data and identify those are at high risk. |  |
|  | Workforce Composition, where the task is to decide how many employees to retrain, hire and fire to meet changing workforce composition requirements while minimizing costs or employee turnover |  |
|  | Vehicle manufacturers, instead of physically crashing dozens of new cars, uses computer programs to run mathematical scenarios. The task is to see all possible effects of different scenarios that could occur to both the vehicle and passengers in a multitude of accidents to determine if the car is safe enough to drive. |  |
|  | Insurance companies tracking and monitoring potential scammers, those who commit insurance fraud, including staged incidents, without spending time sorting through every claim. |  |
|  | Your town is full of residents, and more and more are coming to settle each day. This is putting a strain on town services such as fire and police etc and also creating more traffic jams because the roads just weren't built for handling so much traffic. The task is to figure out a way to either make more roads or redesign existing ones to meet the needs of a growing town and see and analyse the effect it has on the town's traffic before implementing it. |  |
|  | Task is to develop an application that identifies potential defects and nutrient deficiencies in the soil through images. |  |
|  | Whether you work at a bank or in accounting for a business, any finance professional knows how much of a disruption missed payments can be. Financial groups with outstanding invoices need to know who will—and who will not—pay their bills on time. The task here is to identify which individuals or businesses will likely miss their next payment, thus financial groups can better manage cashflow. |  |
|  | Revenue Management, where the task is to determine how many seats to sell or hold back as flight date approaches for different classes of tickets |  |
|  | The scenario consists of cubes in the same size which have all the colour black but named using letters are placed on a surface like a tabletop. A mechanical robot arm has to pick and place the cubes in such a way that it can hold one cube at a time and only one cube can be moved at a time. The goal is to build one or more vertical stacks of blocks. |  |
|  | **Blending purpose, where the task is to   determine which raw materials from different sources to blend to produce a substance with certain desired qualities at minimum cost** |  |

**C. Question Type- Multiple Choice 15\* 2= 30 MARKS**

1. A\* algorithm is based on

(a) Breadth-First Search (b) Depth-First Search

(c) Best-First Search (d) Hill climbing.

(e) Constraint Satisfaction Problem

2. A search method that always reaches a given node by shortest possible path is best described as

a) monotone

b) complete

c) accessible

d) heuristic

3. The A\* algorithm uses the following function to evaluate node; f(node) = g(node) + h(node). What does h(node) represents ?

a) estimated path between the current code to the goal node

b) cost of moving from one node to the other node

c) total path cost

d) none of the above

4. In ANN’s, the process of adjusting the weights is known as?

a) activation

b) synchronisation

c) learning

d) none of the mentioned

5. Uninformed Search is otherwise called as

a) backtracking search

b) guided search

c) blind search

d) heuristic search

6. Foothills are often called as

a) global maxima

b) local maxima

c) beams

d) none of the above

7. A common method to improve the performance of back propagation is

a) including momentum

b) including hyperbolic tangent function

c) vary the learning rate

d) All of the above

8. The truth values of traditional set theory is \_\_\_\_\_\_\_\_\_\_\_\_ and that of fuzzy set is \_\_\_\_\_\_\_\_\_\_.

a. either 0 or 1, between 0 & 1

b. between 0 & 1, either 0 or 1

c. between 0 & 1, between 0 & 1

d. either 0 or 1, either 0 or 1

9. When defining a Fuzzy set X, each element of X is mapped to a value between 0 and 1. It is called \_\_\_\_\_.

a. membership value  
b. degree of membership  
c. universe of membership  
d. both a and b

10. In Membership function graph x-axis represent?

a. universe of discourse.  
b. degrees of membership in the [0, 1] interval  
c. degrees of discourse  
d. universe of membership

11. What is Fuzzy Logic?

a). a method of reasoning that resembles human reasoning  
b). a method of question that resembles human answer  
c). a method of giving answer that resembles human answer.  
d). none of the above

12. What is the full form of JESS in Expert System Technology?

a). Java Expert System Shell  
b). Javascript Expert System Shell  
c). Java Expert Sub System  
d). Javascript Expert Sub System

13. In Feedforward ANN, information flow is \_\_\_\_\_\_\_\_\_.

a) unidirectional  
b) bidirectional  
c) multidirectional  
d) all the above

14. Among the following AI techniques, which one is an approach to learning and problem solving where a new problem is solved by adapting solutions of known similar problems to the new problem?

a) Artificial Neural Networks

b) Swarm Intelligence

c) Genetic Algorithm

d) Case Based Reasoning

e) Fuzzy Systems

15 An informed search strategy is also called a:

1. Simple search
2. Online search
3. Heuristic search
4. None of these

|  |  |  |
| --- | --- | --- |
| Question Item | Question Item Description | Answer Items |
| A | Guaranteed to produce a solution which matches the goal criteria if one exists. In the case that more than one solution meets the criteria, will provide the one with the least cost. |  |
| B | Able to find a solution using as few computing resources as possible. |  |
| C | Capable of generating every possible solution to a problem. |  |
| D | Although a nice idea, this is not a practical requirement for a search algorithm on certain types of problem |  |

**D. Question Type: Match the following 4\* 2= 8 MARKS**

**Four out of nine terms are desirable characteristics for search algorithms, and five acts as a distractor (i.e. is there to confuse you). Match each of these with the appropriate characteristic description of algorithms given in the table. Some of the descriptions will not be appropriate.**

*Choose from below the correct type that matches the* ***Question Item*** *Description and fill the column / space given under* ***Answer Items*** *in the table with the corresponding number.*

[1. Repeatable 2. Predictive 3. Traceable 4. Modifiable 5. Scalable 6. Complete 7.

Efficient 8. Recursive 9. Optimal]

**E. Question Type: Match the following 3\* 2= 6 MARKS**

In practice, when applying a Machine Learning algorithm to learn a model from data, one tends to divide up the data into several sections. What is the function of each?

*Choose from below the correct type that matches the* ***Question Item Description*** *and fill the column / space given under* ***Answer Items*** *in the table with the corresponding numbers:*

1. Used to estimate the accuracy of a model. No model changes are allowed, but may be used to compare between different models - for example to protect against overfitting.

2. Used to get the error, which provides the information to drive the search process.

3. Used to estimate what the accuracy of a learned model will be on unseen data.

|  |  |  |
| --- | --- | --- |
| Question Item | Question Item Description  (Elements of Logic) | Answer Items |
| A | Training Set |  |
| B | Test Set |  |
| C | Validation Set |  |

**F. Question Type- Fill in the Blanks by choosing the most correct answers from the list given. 16\*1=16 Marks**

***[*** *a) weighted b) learning c) rules d) imitate e) learn f) nodes g) updating h) parallel i) human brain j) connectivity k) simple processors l) expert m) weights ]*

ANNs are basically massive **1………….** computational models that **2……….** the function of **3…………**. An ANN consists of large number of **4………….** called **5………** linked by **6…………** connections.

The intelligence of ANN and its capability to solve hard problems emerges from the high degree of **7………….** that gives neurons its high computational power (processing capability) through its massive parallel-distributed structure or architecture, each neuron of which performs only very limited operation. ANNs are highly parallel data processing tools capable of **8………….** functional dependencies of data

A **9………….** process in the ANN context can be viewed as the problem of **10 …………….** network architecture and connection 11……… so that a network can efficiently perform a specific task. Performance is improved over time by iteratively updating the **12………**in the network. ANNs' ability to automatically **13…….** from examples makes them attractive and exciting. Instead of following a set of **14………** specified by human experts, ANNs appear to **15…….** underlying rules (like input-output relationships) from the given collection of representative examples. This is one of the major advantages of neural networks over traditional **16……** systems

**Question Type - True or False** **8\*1=8 Marks**

1. Greedy Search is the variation of A\* Search where g(n) is set to one.

2. A perceptron have the limitation of handling only linear seperable functions.

3. Backward chaining is a bottom up reasoning approach.

4. In ANNs, the process of adjusting weights is called weight mapping.

5. CLIPS is an example for expert system shell.

6. Fuzzy logic is monotonic.

7. The process of obtaining a crisp value from a set of fuzzy variables is known as Fuzzification

8. Mutation is a unary operator.

**Please use this answer booklet to write your answers**

**Villa College**

**FINAL EXAMINATION**

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| **UWE student ID** |
| 21076183 |

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| **Program** | **Intake** |
| BSc (Hons) Computer Science | September 2021 |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Student ID Number | S | 2 | 1 | | 0 | 1 | | 7 | 5 | 5 |
| Learning Centre | Hulhumale' Campus | | | | | | | | | |
| Module Code | U | F | C | | F | D | | 3 | 30 - | 1 |
| Module Name | INTRODUCTION TO ARTIFICIAL INTELLIGENCE | | | | | | | | | |
| Examination Date | 10th May 10, 2022 | | | Session | | | (Morning/Afternoon/Night) | | | |
| Examination Venue | Online | | | | | | | | | |

Answer booklet

1. Question Type – Fill in the blanks
2. Machine Learning
3. Model Unknown
4. Optimization
5. Modelling & Prediction
6. Response
7. Backward chaining
8. Question Type: Match the following
9. c). prediction
10. h). planning
11. j). simulation
12. f). guiding
13. d). modelling
14. c). prediction
15. c). prediction
16. b). estimation
17. f). guiding
18. c). prediction
19. Question Type- Multiple Choice
20. C
21. B
22. A
23. A
24. C
25. B
26. C
27. A
28. B
29. A
30. A
31. A
32. A
33. D
34. C

Answer booklet

1. Question Type: Match the following
2. 6. Complete
3. 9. Optimal
4. 7. Efficient
5. 2. Predictive
6. Question Type: Match the following
7. 2. Used to get the error, which provides the information to drive the search process.
8. 1. Used to estimate the accuracy of a model. No model changes are allowed but may be used to compare between different models - for example to protect against overfitting.
9. 3. Used to estimate what the accuracy of a learned model will be on unseen data.
10. Question Type- Fill in the Blanks by choosing the most correct answers from the list given.
11. h) parallel
12. d) imitate
13. i) human brain
14. k) simple processors
15. f) nodes
16. a) weighted
17. j) connectivity
18. b) learning
19. b) learning
20. h) parallel
21. c) rules
22. m) weights
23. e) learn
24. c) rules
25. e) learn
26. l) expert

Answer booklet

1. Question Type - True or False
2. False
3. True
4. False
5. False
6. True
7. True
8. True
9. True