Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2023/2024

COURSE NAME	:	ARTIFICIAL INTELLIGENCE
COURSE CODE	:	BEJ 42803
PROGRAMME CODE	:	BEJ
EXAMINATION DATE	:	JULY 2024
DURATION	:	3 HOURS
INSTRUCTION	:	1. ANSWER ALL QUESTIONS. COMPLETE PART A IN THE OMR FORM AND PART B IN THIS BOOKLET. 2. THIS FINAL EXAMINATION IS CONDUCTED VIA ☐ Open book ☒ Closed book 3. STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK.

THIS QUESTION PAPER CONSISTS OF **ELEVEN (11)** PAGES

PART A: OBJECTIVE QUESTIONS (40 MARKS)

Q1 Determine the algorithm that removes the branches that don't affect the final output.

(a) A* Search
(b) Minmax Algorithm
(c) Alpha-beta-pruning
(d) None of the above

(2 marks)

Q2 Identify the main drawback of the basic Minimax algorithm.

(a) It requires human intervention
(b) It can be computationally expensive for large trees
(c) It is too fast and skips important calculations
(d) It is too simple for any practical use

(2 marks)

Q3 Identify the contribution of Alpha-Beta Pruning to the optimization of Minimax algorithm.

(a) The number of nodes evaluated
(b) The depth of the search tree
(c) The algorithm's complexity
(d) The memory usage

(2 marks)

Q4 Show how the alpha (α) value changes during Alpha-Beta Pruning when the alpha value is initially set to 5 at a maximizing level, and a newly evaluated node has a value of 4.

(a) It increases
(b) It changes to 4
(c) It stays the same
(d) It become underfined

(2 marks)

Q5 Determine the new value of beta (β) during Alpha-Beta Pruning when a minimizing player encounters a node with a value of 5, given that beta is initially set to 10.

(a) 10
(b) 15
(c) 5
(d) 0

(2 marks)

Q6 Consider **Figure Q6.1**, perform minmax algorithm without pruning. Determine the utility function value.

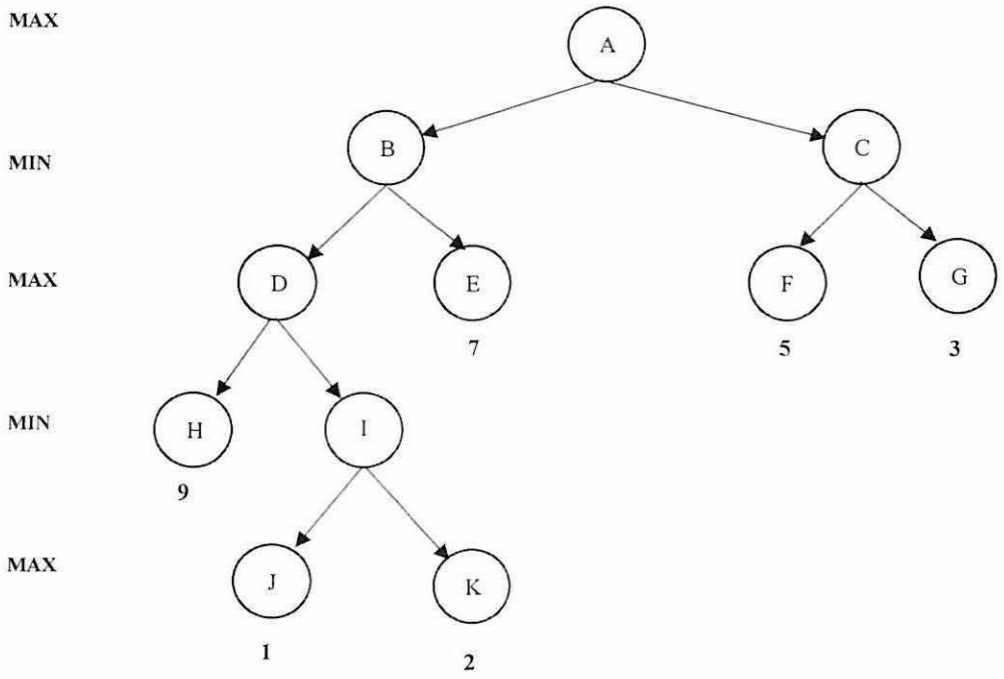

Figure Q6.1 The game tree

(a) 3
(b) 9
(c) 7
(d) 5

(2 marks)

Q7 Based on game tree in **Figure Q6.1**, perform minmax algorithm with Alpha-Beta Pruning. Determine the pruning branch nodes.

(a) Node I
(b) Nodes K and G
(c) Node K
(d) Node G

(2 marks)

Q8 Select the suitable option used to construct complex sentences in knowledge representation.

(a) Symbols
(b) Connectives
(c) Quantifier
(d) Perspective

(2 marks)

Q9 In AI, knowledge can be presented as _____,

i. Predicate Logic
ii. Propositional Logic
iii. Compound Logic
iv. Machine Logic

(a) i and ii
(b) Only ii
(c) ii and iii
(d) ii, iii and iv

(2 marks)

Q10 The First order logic statement contains _____,

(a) Predicate and Preposition
(b) Subject and Object
(c) Predicate and Subject
(d) Preposition and Logic

(2 marks)

Q11 Identify the component of knowledge representation used for constructing legal sentences in logic.

(a) Syntax
(b) Semantic
(c) Inference Engine
(d) Knowledge base

(2 marks)

Q12 Translate the logic predicates $\forall x L(x)$ into statements. Given that:

C(x):x is a FKEE student
L(x):x loves music

(a) All students love music
(b) Some students love music
(c) Every FKEE students love music
(d) Some FKEE student love music

(2 marks)

Q13 The inference engine is a core element in expert systems, facilitating logical deductions based on input data and the knowledge base. The inference engine works on _____,

(a) Forward Chaining
(b) Backward Chaining
(c) Both Forward and Backward Chaining
(d) None of the above

(2 marks)

Q14 Consider the following familiar set of rules. Determine the suitable rule will be put into conflict set by the system if the working memory contains two facts: *green, blinking*.

1	IF	*green*	THEN	*walk*
2	IF	*red*	THEN	*wait*
3	IF	*green* AND *blinking*	THEN	*hurry*
4	IF	*red* OR *green*	THEN	*traffic light works*

(a) Rules 1,3 and 4
(b) Rules 1 and 3
(c) Rule 1
(d) Rule 4

(2 marks)

Q15 Analyze the shortcomings of semantic networks.

(a) Intractability
(b) Lack of expressing some of the properties
(c) Incomplete
(d) Has memory constraints

(2 marks)

Q16 Choose the best example of semantic networks.

(a) Autonomous car driver
(b) Human food chain
(c) MYSIN-expert system medical diagnosis
(d) Wordnet database

(2 marks)

Q17 Based on your understanding in supervised learning, identify tasks that fall within this category.

(a) Predicting the risk of an accident at an intersection
(b) Identifying cars, bycyclists and pedestrians in video
(c) Determining the probability of a stop sign in an image
(d) Generating new road scenarios for testing autonomous vehicles

(2 marks)

Q18 Identify suitable learning task in generating new road scenarios for testing autonomous vehicles.

(a) Regression analysis
(b) Object classification
(c) Probabilistic classification
(d) Unsupervise learning

(2 marks)

Q19 Evaluate which statement accurately describes supervised learning.

(a) a fully autonomous learning with no human interference
(b) learning algorithms with no control over quality of their predictions
(c) unsupervised learning comprises algorithms with no pre-existing outcomes
(d) a semi-autonomous learning where researchers control some parts of the modelling process

(2 marks)

Q20 Determine which statement accurately describes overfitting in machine learning.

(a) a model with too many predictors
(b) models predicts accurate training data but perform poorly on testing and validation
(c) predictions that very highly accurate
(d) a model with too many outcome classes

(2 marks)

PART B SUBJECTIVE QUESTIONS (60 MARKS)

Q21 You want to determine how accurate is the sentiment analysis of customer reviews for a product on e-commerce platform based on the rating of the reviews. **Figure Q21.1** shows the network for learning to classify the rating of the product reviews. The like or dislike of a product review is quantified as a scalar between 0 and 1, given by the activation function in **Figure Q21.2**.

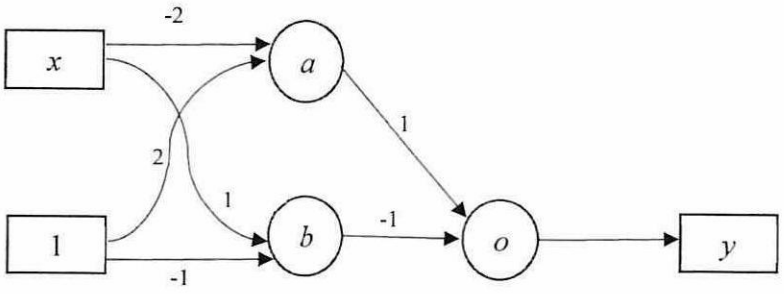

Figure Q21.1 Learning network

$$\varphi(v) = \begin{cases} 1 & if\ v \geq 0 \\ 0 & otherwise \end{cases}$$

Figure Q21.2 The activation function

(a) Calculate the weighted sum of hidden nodes a, b and o.

(6 marks)

(b) Based on your answer in **Q21(a)**, compute the feed-forward output value y for the input pattern $x = 0$, 0.5 and 1.

(20 marks)

(c) In your opinion, is this network is suitable for effectively train and learn the data for product review ratings and recommendation? Explain and justify your answer.

(4 marks)

Q22 **Figure Q22.1** shows diagram of data points that belong to two distinct classes: Negative and Positive. The Negative class includes the points (-1, 0), (2, 1), and (2, -2), while the Positive class consists of the points (0, 0) and (1, 0).

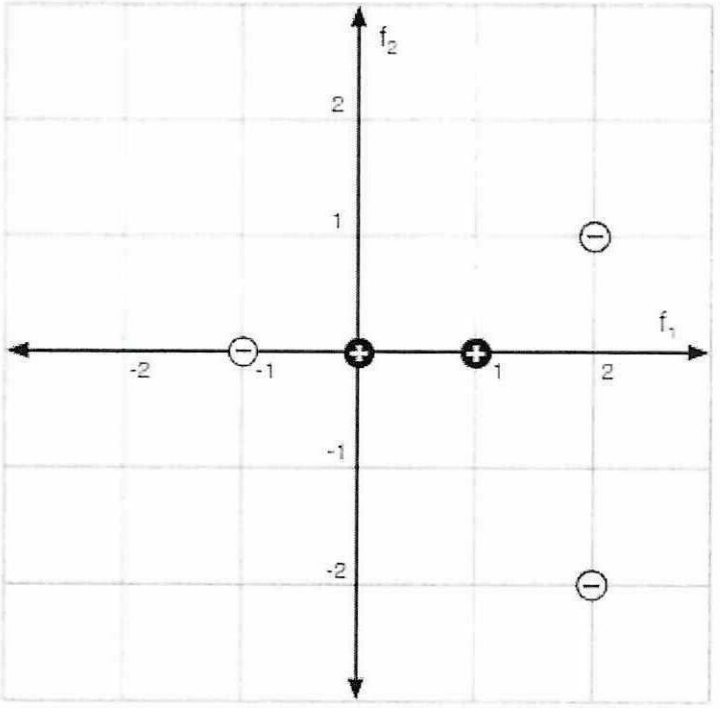

Figure Q22.1 Datapoints features

(a) Determine how new datapoint: (1, -1.01) is classified by 1-NN using Euclidean distance. Justify your answer.

(6 marks)

(b) Determine how new datapoint: (1, -1.01) is classified by 3-NN using Euclidean distance. Justify your answer.

(14 marks)

(c) Based on the datapoints given in **Figure Q22.1** construct a decision tree graph to represent the boundaries between Positive and Negative classess.

(10 marks)

- **END OF QUESTIONS** -