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BRAINWARE UNIVERSITY

Term End Examination 2024-2025
Programme – Dip.RA-2023
Course Name – AI in Robotics
Course Code - ECPE402C
(Semester IV)

Full Marks : 60 **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A
(Multiple Choice Type Question) 1 x 15=15

1. *Choose the correct alternative from the following :*

(i) Indicate from the following that is a characteristic of First Order Predicate Calculus.

a) It only deals with propositions
b) It allows for quantification over individuals
c) It doesn't support logical connectives
d) It's limited to binary relations

(ii) Choose from the following is an example of theorem proving in AI.

a) Predicting stock market trends
b) Solving mathematical problems
c) Playing chess
d) Recognizing faces

(iii) Indicate the main focus of vision and speech processing in AI.

a) Analyzing written documents
b) Interpreting visual and auditory data
c) Creating virtual reality environments
d) Controlling robotic movements

(iv) Identify from the following an expert systems in AI.

a) Learning new skills autonomously
b) Replicating human decision-making processes
c) Performing physical tasks with precision
d) Analyzing large datasets for patterns

(v) Select an algorithm that efficiently solves constraint satisfaction problems by systematically assigning values to variables.

a) Best-first search
b) Hill climbing

c) Branch and bound
d) Backtracking

(vi) Indicate a search algorithm that iteratively reduces the problem by decomposing it into smaller subproblems until a solution is found.

a) Means-End Analysis
b) Problem Reduction
c) State space search
d) Branch and bound

(vii) Select from the following that production systems are used.

a) Heuristic search
b) Constraint satisfaction problems
c) Means-End Analysis
d) Problem Reduction

(viii) Identify from the following algorithm that combines the benefits of both breadth-first and depth-first search by using an iterative deepening approach.

a) LA* Algorithm
b) AO* Algorithm
c) Hill climbing
d) Depth-first search

(ix) In the context of heuristic search, AO* indicates.

a) Adaptive Optimization Algorithm
b) Advanced Objective Algorithm
c) Analytical Optimization Algorithm
d) Anytime Optimized Algorithm

(x) What does the term "vanishing gradient" relate to in neural networks?

a) Slow convergence during training
b) Rapid convergence during training
c) Unstable activation functions
d) Difficulty in updating weights in deep networks

(xi) Select the type of neural network that is designed to mimic the structure of the human brain.

a) Convolutional neural network
b) Recurrent neural network
c) Feedforward neural network
d) Long Short-Term Memory (LSTM) network

(xii) Indicate how a genetic algorithm handles the search space in optimization problems.

a) By exhaustively searching all possible solutions
b) By randomly generating solutions
c) By evaluating fitness for each solution
d) By exploring promising regions of the search space

(xiii) Choose the primary challenge in training deep neural networks.

a) Overfitting
b) Underfitting
c) Vanishing gradients
d) High computational cost

(xiv) Indicate the purpose of regularization techniques in neural networks.

a) To increase the number of parameters
b) To introduce noise in the data
c) To prevent overfitting
d) To reduce the learning rate

(xv) Select from the following that is NOT a common type of activation function used in neural networks.

a) ReLU
b) Sigmoid
c) Linear
d) Exponential

Group-B

(Short Answer Type Questions) 3 x 5=15

2. Explain the concept of learning rate in Artificial Neural Networks (ANNs) and its impact on model training and convergence. (3)

3. Give an example of Heuristic Search. (3)

4. Define state space search. (3)

5. Give an example of Breadth-First Search. (3)

6. Explain frame in AI with an example. (3)

OR

Illustrate Structure of a Partitioned Network. (3)

Group-C
(Long Answer Type Questions) 5 x 6=30

7. Discuss the role of regularization techniques such as L2 regularization and dropout in preventing overfitting in Artificial Neural Networks (ANNs). (5)

8. Explain Bidirectional Search. (5)

9. Illustrate how semantic analysis in NLP enhances language understanding. (5)

10. Give an example of a semantic network. (5)

11. Explain the concept of learning algorithms in Artificial Neural Networks (ANNs) and their role in model training. (5)

12. Illustrate techniques that are used in Natural Language Processing (NLP) and how they contribute to language understanding. (5)

OR

Explain Horn Clauses, First Order Predicate Calculus, and Resolution in AI, and how are they used in logical reasoning. (5)

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