KATHMANDU UNIVERSITY
End Semester Examination [C]
December, 2024

Marks Scored:

Level : B.Tech.
Year : II

Course : AICC 201
Semester : I

Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No.:

Date : 11 Dec,

SECTION "A"

[20Q. × 0.5 = 10 marks]

Choose and encircle in the most appropriate option from each set of choices.

1. Which of the following is a key component of the Turing Test setup?
   a. A direct physical interaction between a human and a machine
   b. A conversation between a human judge, a human respondent, and a machine via text
   c. A machine solving complex mathematical problems in front of a human audience
   d. A comparison of a machine's speed with a human's speed in a quiz

2. What is a key component of an AI agent?
   a. The ability to ignore environmental changes
   b. A pre-programmed set of responses without any adaptability
   c. Exclusive reliance on human intervention to make decisions
   d. Sensors to perceive the environment and actuators to perform actions

3. Which of the following is a characteristic of a breadth-first search strategy?
   a. Explores the shallowest nodes first, level by level
   b. Always finds the shortest path in any weighted graph
   c. Prefers deeper nodes before exploring shallow ones
   d. Requires no memory for storing nodes

4. Which of the following is **NOT** a component of state space representation?
   a. Initial state b. Goal state c. Operator d. Search algorithm

5. What is a key characteristic of uninformed search strategies?
   a. They rely on a heuristic to guide the search process
   b. They expand nodes without using domain-specific knowledge
   c. They guarantee finding the optimal solution in all cases
   d. They are faster than informed search strategies in all scenarios

6. Which of the following is an example of a Constraint Satisfaction Problem?
   a. Finding the shortest path in a graph b. Training a machine learning model
   c. Solving a Sudoku puzzle d. Performing a depth-first search

7. Which of the following concepts is closely related to the minimax algorithm in artificial intelligence?
   a. Optimal decision making b. Randomized search
   c. Genetic algorithms d. Reinforcement learning

8. Which of the following characteristics is essential for a problem to be well-defined in AI?
   a. It must involve real-world uncertainty
   b. It must be solvable only by humans
   c. It must have a measurable solution and a clear evaluation criterion
   d. It must allow for multiple ambiguous interpretations

9. Which of the following is a feature of temporal logic?
   a. It deals only with static conditions
   b. It uses time-related operators like "always" and "eventually"
   c. It cannot handle sequential events
   d. It exclusively applies to numerical reasoning

10. What is the purpose of a planning language in artificial intelligence?
   a. To represent actions, goals, and constraints for automated planning systems
   b. To simulate human emotions in machines
   c. To optimize the execution of machine learning models
   d. To generate random solutions to complex problems

11. What is a planning graph in artificial intelligence?
   a. A layered structure that represents actions and states for planning problems
   b. A graph that represents a neural network architecture
   c. A decision tree used for classification tasks
   d. A graph used to find the shortest path in a weighted network

12. What is the primary use of Bayes' Rule in artificial intelligence?
   a. To perform optimization in reinforcement learning
   b. To update the probability of a hypothesis based on new evidence
   c. To calculate the shortest path in a network
   d. To train deep learning models

13. Which of the following techniques is commonly used in handling uncertain knowledge in artificial intelligence?
   a. Decision trees
   b. Reinforcement learning
   c. Bayesian networks
   d. Support vector machines

14. Which machine learning technique involves an agent learning to make decisions by performing certain actions and receiving rewards or penalties?
   a. Self-supervised learning
   b. Reinforcement learning
   c. Semi-supervised learning
   d. Transfer learning

15. In a machine learning project pipeline, what is the purpose of model evaluation?
   a. To select the best model based on performance metrics
   b. To generate training data for the model
   c. To implement the model into a production environment
   d. To remove irrelevant features from the dataset

16. What is the primary purpose of data normalization in machine learning?
   a. To reduce the dimensionality of the dataset.
   b. To remove missing values from the dataset.
   c. To extract relevant features from the dataset.
   d. To standardize the scale and range of the data.

17. Which of the following is **NOT** a valid weight initialization strategy?
    a. He initialization
    b. Xavier initialization
    c. Normal distribution with zero mean and unit variance
    d. Setting all weights to a small fixed constant

18. Which of the following optimization technique **NOT** use adaptive learning rate?
    a. SGD b. RMSprop c. Adagrand d. Adam

19. Which of the following methods is commonly used for hyperparameter tuning in machine learning?
    a. Grid search b. Data splitting c. Regularization d. Feature extraction

20. Which of the following techniques is used to reduce bias in AI systems?
    a. Increasing the model's complexity
    b. Using a more diverse and representative dataset
    c. Limiting the number of features used in the model
    d. Reducing the size of the training dataset

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SECTION "B"
[6 Q. × 4 = 24 marks]

Attempt *ANY SIX* questions. (**Q.N. 3 is compulsory**)

1. Explain the key characteristics of AI agents and provide a real-world example to illustrate their functionality

2. Discuss your opinion with a relevant example to highlight the advantages of informed search over uninformed search.

3. Solve following crypto arithmetic problem:

```
  C R O S S
+ R O A D S
-----------
D A N G E R
```

4. How planning is used in problem solving? Explain planning steps for a simple block moving Robert.

5. Explain various knowledge representation methods in artificial intelligence.

6. Explain the basic pipeline of machine learning integrating an example of image classification?

7. Explain the working mechanism of artificial neural networks and how they replicate the function of biological neurons.

SECTION "C"
[2Q. × 8 = 16 marks]

Attempt *ANY TWO* questions. (**Q.N. 9 is compulsory**)

8. Three man and three boys need to cross a river. The any boat available will hold just one man or just two boys. Everyone is capable of rowing the boat. How can the trip be achieved and what is the fewest number of trips needed?

9. Design a multilayer perceptron (MLP) for classifying four varieties of dog breeds using two hidden layers. The input size is 512, and each layer in the network uses a ReLU activation function, dropout rate of 0.1, and batch normalization. Use pseudo code or Python code to implement the system for the classification problem.

10. Write short note on: [4Q × 2=8]
    a. Eight queens puzzle
    b. Data normalization
    c. Online Learning
    d. Gradient descent