KATHMANDU UNIVERSITY
End Semester Examination
June/July, 2023

Marks Scored:

Level : B.Tech.
Year : II
Course : AICC 201
Semester : I
Exam Roll No. :
Time: 30 mins.
F. M. : 10
Registration No.:
Date : July-09

SECTION "A"
[20Q. × 0.5 = 10 marks]

Encircle the most appropriate option from each set of choices.

1. The AI definition by Winston (1992) "The study of the computations that make it possible to perceive, reason and act" fall under the category of ….
   a. Acting humanly
   b. Thinking humanly
   c. Think rationally
   d. Act rationally

2. Which of the following characteristics best describes an artificial intelligence agent?
   a. Speed
   b. Autonomy
   c. Determinism
   d. Simplicity

3. Which of the following evaluation metrics is commonly used to assess the efficiency of search strategies in artificial intelligence?
   a. Accuracy
   b. Precision
   c. Time complexity
   d. Recall

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. Which of the following search strategies is an example of uninformed search?
   a. A* search
   b. Depth-first search
   c. Best-first search
   d. Greedy search

6. Which of the following best describes a constraint satisfaction problem in artificial intelligence?
   a. A problem where the goal is to find the optimal solution among a set of possibilities.
   b. A problem where the goal is to maximize a specific objective function.
   c. A problem where the goal is to satisfy a set of constraints while finding a valid solution.
   d. A problem where the goal is to perform a sequence of actions to reach a desired state.

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. A well-defined formula is neither always true nor false then it is said to be….
   a. Tautology
   b. Contingent
   c. Contradiction
   d. Ill-defied formula

9. Temporal Logic is primarily concerned with the specification and verification of….
   a. Spatial relationships in a given environment
   b. The dynamic behavior and temporal properties of systems
   c. The dynamic behavior and temporal properties of systems
   d. The statistical analysis of data sets

10. Which of the following is planning language?
    a. Lisp b. Python c. Prolog d. PDDL

11. Planning graphs are commonly used in artificial intelligence for....
    a. Generating random search paths in a search space
    b. Analyzing the time complexity of planning algorithms
    c. Representing and reasoning about the states and actions in a planning problem
    d. Estimating the uncertainty of outcomes in decision-making processes

12. Which of the following formulas represents Bayes' Rule?
    a. $P(A \cap B)=P(A) \cdot P(B|A)$
    b. $P(A \cup B)=P(A)+P(B)$
    c. $P(A|B)= \{P(A) \cdot P(B|A)\}/P(B)$
    d. $P(A|B)=P(A) \cdot P(B|A)$

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 of the following machine learning technique need NO any label during training?
    a. Supervised learning
    b. Self-supervised learning
    c. Semi-supervised learning
    d. Weakly supervised learning

15. Which of the following represents a typical machine learning project pipeline?
    a. Data preprocessing, feature selection, model evaluation
    b. Model training, data visualization, data collection
    c. Data cleaning, hyperparameter tuning, model deployment
    d. Feature extraction, model testing, data augmentation

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. Why is weight initialization important in training neural networks?
    a. It determines the learning rate during training.
    b. It ensures convergence to the global minimum during optimization.
    c. It helps prevent vanishing or exploding gradients during backpropagation.
    d. It determines the activation function used in each neuron.

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

19. What is the purpose of hyperparameter tuning in machine learning?
    a. To automatically select the best features for the model.
    b. To preprocess and normalize the input data.
    c. To optimize the learning rate during model training.
    d. To find the optimal values for the model's hyperparameters.

20. What is the primary concern when addressing fairness and bias in AI systems?
    a. Accuracy of the predictions made by the system.
    b. Complexity and performance of the system.
    c. Interpretability and transparency of the system.
    d. Impact and potential discrimination caused by the system.

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SECTION "B"
[6Q. × 4 = 24 marks]

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

1. What is AI agent? Explain the characteristics of AI agents with their PEAS representation.

2. Differentiate uninformed and informed search with proper example.

3. Solve following crypto arithmetic problem:

$$\begin{array}{r} \text{CROSS} \\ +\text{ROADS} \\ \hline \text{DANGER} \end{array}$$

4. What is adversarial search? Explain min-max search procedure with an appropriate example.

5. What are the possible approaches of knowledge representation? How planning can help in proper knowledge representation?

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

7. Define feed forward neural network. Explain the importance of interpretability of neural network with a use case scenario.

SECTION "C"
[2Q. × 8 = 16 marks]

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

8. In a distinct land, bigamy is common. There are six people who want to cross a river in this land. This group consists of two men, each two wives. No man can tolerate any of his wives being in the company of another man unless he is present to chaperone. There is a boat that holds two people to be used for crossing the river. What is the fewest number of trips possible? Use proper notations and production rules to solve this problem.

9. Design a multilayer perception for regression problem with two hidden layers. The input size is 128 and ReLU activation function, dropout of 0.2 and batch normalization in each layer of network. Use pseudo code or Python code to implement the system for regression problem.

10. Write short note on: [4 × 2 = 8]
    a. Online search
    b. Unification algorithm
    c. Need of data privacy
    d. Gradient descent