

**MACHINE INTELLIGENCE AND INTRODUCTION TO PYTHON
(ECEN 4248)**

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
any 5 (five) from Group B to E, taking at least one from each group.*

Candidates are required to give answer in their own words as far as practicable.

**Group – A
(Multiple Choice Type Questions)**

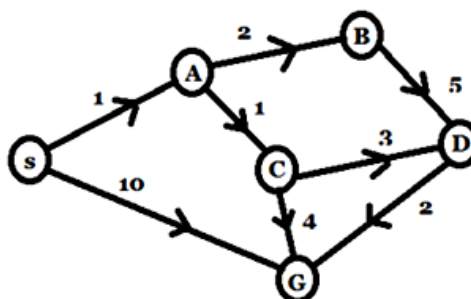
1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) Select the most appropriate situation for that a blind search can be used.
 - (a) Real-life situation
 - (b) Small Search Space
 - (c) Complex game
 - (d) All of the above
 - (ii) Among the given options, which search algorithm requires less memory?
 - (a) Optimal Search
 - (b) Depth First Search
 - (c) Breadth-First Search
 - (d) Linear Search.
 - (iii) An Artificial Intelligence agent perceives and acts upon the environment using _____.
 - (a) Sensors
 - (b) Perceiver
 - (c) Actuators
 - (d) Both (a) and (c)
 - (iv) A hybrid Bayesian Network consist _____.
 - (a) discrete variables only
 - (b) discontinuous VArable
 - (c) both discrete and continuous variables
 - (d) continuous variable only
 - (v) The PEAS in the task environment is about _____.
 - (a) Peer, Environment, Actuators, Sense
 - (b) Performance, Environment, Actuators, Sensors
 - (c) Perceiving, Environment, Actuators, Sensors
 - (d) None of the above
 - (vi) First order logic Statements contains _____.
 - (a) predicate and preposition
 - (b) subject and an object
 - (c) predicate and subject
 - (d) none of the above

- (vii) The inference engine works on _____.
 (a) forward chaining (b) backward chaining
 (c) both (a) and (b) (d) none of the above
- (viii) Translate the following statement into FOL.
 "For every a, if a is a philosopher, then a is a scholar"
 (a) $\forall a \text{ philosopher}(a) \rightarrow \text{scholar}(a)$ (b) $\exists a \text{ philosopher}(a) \rightarrow \text{scholar}(a)$
 (c) All of the mentioned (d) None of the mentioned
- (ix) Which of the following is a disadvantage of decision trees?
 (a) Factor analysis
 (b) Decision trees are robust to outliers
 (c) Decision trees are prone to be overfit
 (d) None of the above.
- (x) In what type of learning labelled training data is used?
 (a) Unsupervised learning (b) Supervised learning
 (c) Reinforcement learning (d) Active learning.

Group- B

2. (a) Define intelligent agent. Distinguish between fully observable & partially observable environment. [(C01)(Remember/LOCQ, Analyze/IOCQ)]
 (b) List different types of agent present in Artificial Intelligence. Compare the features of simple reflex agent and model based reflex agent. [(C01)(Remember/LOCQ, Analyze/IOCQ)]
(2 + 3) + (2 + 5) = 12
3. (a) What is time complexity of an algorithm? Explain Depth First Search with an example. Find the time complexity of Depth First Search. [(C02)(Remember/LOCQ, Analyze/IOCQ)]
 (b) For the following graph, identify the shortest path and the corresponding cost using A* algorithm.

State	$h(n)$
S	5
A	3
B	4
C	2
D	6
G	0



Symbols have their usual meaning.

[(C02)(Evaluate/HOCQ)]
(1 + 4 + 3) + 4 = 12

Group – C

4. (a) Identify the limitations in propositional logic. What is universal quantifier in predicate logic? [(C02)(Analyze/IOCQ, Remember/LOCQ)]

- (b) Represent the following information using FOL
(i) Not all student like both communication and VLSI (ii) Every man who buys a policy is smart. (iii) All dogs eat meat. [[CO2](Evaluate/HOCQ)]
(3 + 3) + 6 = 12
5. (a) From the given rules and facts, conclude Kapil is an all-rounder using forward chaining.
Rule1: IF a player is good in bowling session AND excellent in batting, THEN he is an all-rounder.
Rule 2: IF a player gets 4 wickets in a session AND saves 20 runs during fielding THEN he is good in bowling session
Rule 3: IF the player is making century THEN he is excellent in batting.
Facts (Data): 1. Kapil got 4 wickets in a session. 2. Kapil is making century. 3. Kapil Saves 20 runs during fielding. [[CO3](Evaluate/HOCQ)]
- (b) Define prior probability. With proper example explain Bayesian network. [[CO2](Remember/LOCQ, Analyze/IOCQ)]
7 + (2 + 3) = 12

Group - D

6. (a) Illustrate the semi-supervised learning method. [[CO4](Remember/LOCQ)]
(b) What are Decision Trees? Explain the structure of Decision Tree. [[CO4](Remember/LOCQ, Analysis /IOCQ)]
(c) Is Naive Bias a classification algorithm or regression algorithm? State some benefits of Naive Bias algorithm. [[CO4](Analysis /IOCQ)]
4 + (2 + 4) + 2 = 12
7. (a) Explain what is k-Means Clustering. Mention few Stopping Criteria for k-Means Clustering. [[CO4](Analysis/IOCQ)]
(b) Highlight the main differences between k-Means and k-Nearest Neighbours. [[CO4](Analysis/IOCQ)]
(c) Compare Hierarchical Clustering and k-Means Clustering. [[CO4](Analysis/IOCQ)]
(2 + 2) + 4 + 4 = 12

Group - E

8. (a) Describe Arithmetic Operators, Assignment Operators, Comparison Operators, Logical Operators, and Bitwise Operators in detail with examples. [[CO5](Evaluate/HOCQ)]
(b) Give information about the different string formats available in Python. [[CO5](Remember/LOCQ)]
10 + 2 = 12

9. (a) What is data pre-processing in machine learning in python? Name the categories of Machine Learning Algorithms with Python. [(CO5,CO6)(Remember/LOCQ)]
(b) Write short notes on Scikits learning, NumPy, and Scipy. [(CO5,CO6)(Remember/LOCQ)]
(3 + 3) + 6 = 12
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Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	31.25	40.63	28.13

Course Outcome (CO):

After the completion of the course students will be able to

1. Evaluate of Machine Intelligence (MI) methods and its foundations.
2. Apply basic principles of machine intelligence in solutions that require problem solving, perception, knowledge representation, and learning.
3. Show the importance of MI and planning in solving real world problems.
4. Demonstrate working knowledge of reasoning in the presence of incomplete and/or uncertain information also to show how the searching algorithms playing vital role in problem solving.
5. Learn and understand the basics of the Python Programming Language.
6. Design simple software to experiment using Python with various MI concepts.

*LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question;
HOCQ: Higher Order Cognitive Question