No. of Printed Pages : **3**

Sl. No.

B3.2-R5 : ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

NOTE :

1. **Answer question 1 and any FOUR questions from 2 to 7.**
2. **Parts of the same question should be answered together and in the same sequence.**

Total Time : 3 Hours **Total Marks : 100**

1. (a) Python uses the Call by Value or Call by Reference. How are arguments passed by value or by reference ?

(b) What are the hard margin and soft margin support vector machines ?

(c) What factors affect the performance of a face recognition system ?

(d) What is the difference between policy and value function in reinforcement learning ? Why do we prefer Q-learning ?

(e) What is sampling with replacement and without replacement ? Explain with the help of example for each.

(f) Draw a graph of state space vs objective function that indicate both global and local maxima. Explain simple hill climbing algorithm.

(g) Explain the different types of ambiguity associated with Natural Language Processing.

(7x4)

2. (a) Differentiate between informed and uninformed search in Artificial Intelligence.

(b) Discuss various types of intelligent agents in Artificial Intelligence.

(c) What are the key differences between OLAP and OLTP ?

(5+9+4)

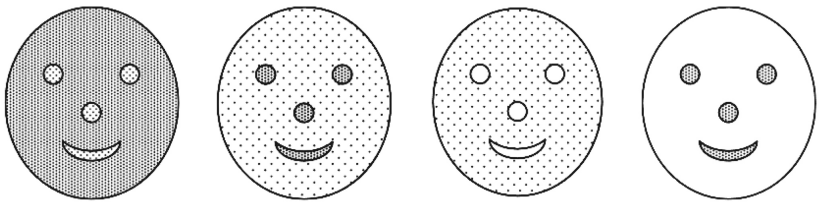
3. (a) Given three Points (x1, y1), (x2, y2) and (x3, y3), write a Python program to check if they are Collinear or not.

(b) Write a Python program to find the longest word in a file. Take the file name from user as input.

(c) Write a Python program to color between the curve of the mathematical function $f(x)=\sin(x)$.

(5+5+8)

4. Consider the following four faces as shown in Figure 1. You are given two sets of 100 points that fall within the unit square. Again, darkness or number of dots represents density. Lines are used only to distinguish regions and do not represent points.



(a) (b) (c) (d)

Figure 1. Smiling Faces

(a) For each figure, could you use single linkage hierarchical clustering to find the patterns represented by the nose, eyes and mouth ? Explain.

(b) For each figure, could you use K-means to find the patterns represented by the nose, eyes and mouth ? Explain.

(c) What limitation does clustering have in detecting all the patterns formed by the points in Figure 1.

(7+7+4)

5. Consider the following dataset for a binary class problem.

A	B	Class Label
T	F	+
T	T	+
T	T	+
T	F	-
T	T	+
F	F	-
F	F	-
F	F	-
T	T	-
T	F	-

(a) Calculate the information gain when splitting on A and B. Which attribute would the decision tree induction algorithm choose as root ?

(b) Calculate the gain in the Gini index when splitting on A and B. Which attribute would the decision tree induction algorithm choose as root ?

(c) Is it possible that information gain and the gain in the Gini index methods favor different attributes as root node or both favour the same attribute as root node.

(7+7+4)

6. (a) What are the softmax and ReLU functions in deep learning ?
   (b) What will happen if the learning rate is set too low or too high in deep learning technique ?
   (c) What is the difference between Batch Gradient Descent and Stochastic Gradient Descent ?
   (d) What is overfitting and underfitting problems in deep learning techniques ? How to combat them ?

(4+4+4+6)

7. (a) What exactly is NLTK ? What distinguishes it from Spacy ?
   (b) Explain the role of transformational rules in transformational grammar with the help of an example.
   (c) List the problems associated with n-gram model. Explain how these problems are handled.

(6+4+8)

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