**VIT**

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

Programme Name & Branch: B.Tech & Common to All Branches

Course Name & Code: CSE4020 – Machine Learning

Class Number: VL2019205001957, 1960, & 1969   **Slot:** B2

Faculty Name: Prof. USHA DEVI G, Prof. JAISAKTHI S M & Prof VIJAYARAJAN V

Exam Duration: 2.00 PM – 3.30 PM   **Maximum Marks: 50**

Section – A
Answer all the Questions

S. No.	Question
1.	Explain the various learning paradigms with suitable examples in each paradigm. **(Marks: 10)**
2.	Consider the instance space consisting of integer points in the x, y plane and the set of hypotheses H consisting of rectangles. More precisely, hypotheses are of the form $a \leq x \leq b, c \leq y \leq d,$, where a, b, c, and d can be any integers. **(Marks : 3+3+4)**
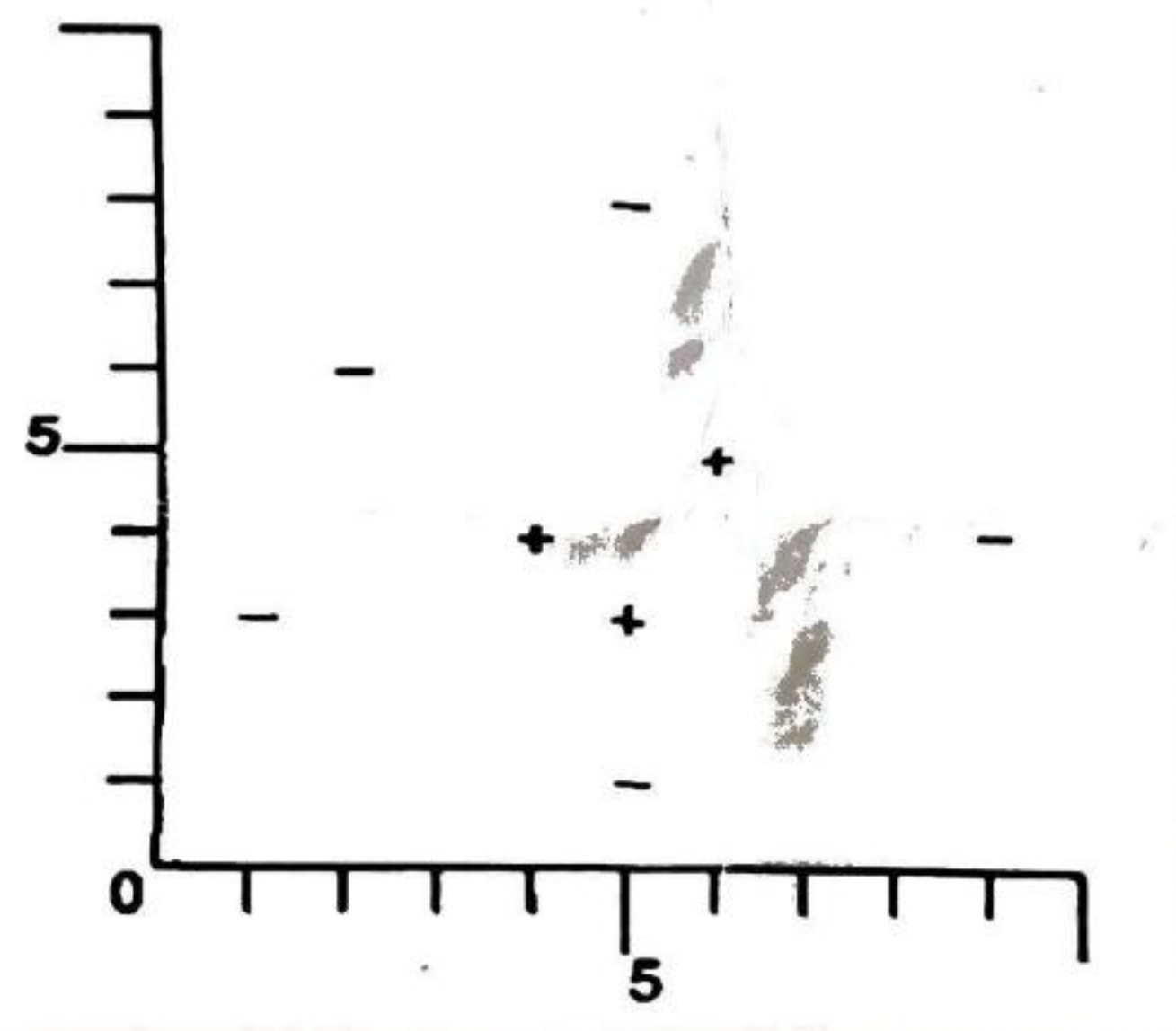
(a) Consider the version space with respect to the set of positive (+) and negative (-) training examples shown below. What is the S boundary of the version space in this case? Write out the hypotheses and draw them in on the diagram.

(b) What is the G boundary of this version space? Write out the hypotheses and draw them in.

(c) Suppose the learner may now suggest a new x, y instance and ask the trainer for its classification. Suggest a query guaranteed to reduce the size of the version space, regardless of how the trainer classifies it. Suggest one that will not.

3. Study the relationship between the monthly e-commerce sales and the online advertising costs. You have the survey results for 7 online stores for the last year. Draw a scatter plot and find the equation of the regression line that fits the data best. Also forecast the monthly sale if advertisement cost is Rs 6000 and Rs 7000 (**Marks: 10**)

Online Store	Monthly E-commerce in INR Sales(in 1000 s)	Online Advertising in INR (in 1000 s)
1	368	1.7
2	340	1.5
3	665	2.8
4	954	5
5	331	1.3
6	556	2.2
7	376	1.3

4. Build a decision tree model to learn about the person who gets sunburn based on features of past experience (training samples) given below by describing ID3 algorithm.

Name	Hair	Height	Weight	Lotion	Result
Sarah	blonde	average	Light	No	sunburned (positive)
Dana	blonde	Tall	average	Yes	none (negative)
Alex	brown	short	average	Yes	none
Annie	blonde	short	average	No	sunburned
Emily	red	average	heavy	No	sunburned
Pete	brown	Tall	heavy	No	none
John	brown	average	heavy	No	none
Katie	blonde	short	Light	Yes	none

Also predict the given instances {Sam, brown, average, average, no} and {Raj , blonde, average, average, yes} (**Marks: 20**)