**3 hours** **Marks:80**

a) Question No. 1 is compulsory
b) Attempt **any three** from the remaining Five questions
c) Assumptions should be made whenever required and should be clearly stated
d) Answers to sub questions should be answered together
e) Illustrate answers with diagrams wherever necessary
f) Use of Calculators is permitted

Q1.
a) What is machine learning?. List various applications of machine learning. (10)
b) Explain in detail about the dimensionality reduction techniques (10)

Q2.
a) What is an anomaly? Analyze the various methods of Anomaly detection (10)
b) Explain about how to separate data with maximum margin using support vector machine (10)

Q3.
a) With the help of the training sample given below, using Baye's classification and can we believe that a patient having the given symptom X={Yes, No, Mild, Yes, ? } has flu? (10)

| Chills | Runny nose | Headache | Fever | Flu? |
|---|---|---|---|---|
| Yes | No | Mild | Y | No |
| Yes | Y | No | No | Yes |
| Yes | No | Strong | Y | yes |
| No | Y | Mild | Y | yes |
| No | No | No | No | No |
| No | Y | Strong | Y | yes |
| No | Y | Strong | No | No |
| Yes | Y | Mild | Y | yes |

b) Explain effective optimization using SMO algorithm (10)

Q4.
a) Explain about hierarchical clustering techniques (10)
b) From the following data find the best fit line using linear regression of sales on purchase (10)

| Sales | 91 | 97 | 108 | 121 | 67 | 124 | 51 | 73 | 111 | 57 |
|---|---|---|---|---|---|---|---|---|---|---|
| Purchase | 71 | 75 | 69 | 97 | 70 | 91 | 39 | 61 | 80 | 47 |

Q5.
a)Explain how to improve classifier by focusing on errors (10)
b) Explain K-Means clustering algorithm. Perform K-means clustering using Euclidian distance measure for the given data set. K=2. (10)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| A | 1.0 | 1.5 | 3.0 | 5.0 | 3.5 | 4.5 | 3.5 |
| B | 1.0 | 2.0 | 4.0 | 7.0 | 5.0 | 5.0 | 4.5 |

Q6. Write short notes on any four (20)

a) Decision stump
b) Bayesian belief network.
c) Big data
d) Hypothesis Space
e) Logistic regression
f) Weak learners