

| Q1.       | Choose the correct option for following questions. All the Questions are compulsory and carry equal marks   |
|-----------|---|
| 1.        | Machine learning is a branch of..   |
| Option A: | Artificial intelligence   |
| Option B: | speech processing   |
| Option C: | Language processing   |
| Option D: | java  |
| 2.        | What does K stand for in K mean algorithm?  |
| Option A: | Number of Clusters  |
| Option B: | Number of Data  |
| Option C: | Number of Attributes  |
| Option D: | Number of Iterations  |
| 3.        | Feature selection tries to eliminate features that are  |
| Option A: | Rich  |
| Option B: | important   |
| Option C: | Irrelevant  |
| Option D: | Relevant  |
| 4.        | During the treatment of cancer patients , the doctor needs to be very careful about which patients need to be given chemotherapy. Which metric should we use in order to decide the patients who should given chemotherapy? |
| Option A: | precision   |
| Option B: | recall  |
| Option C: | call  |
| Option D: | score   |
| 5.        | Targetted marketing, Recommended Systems, and Customer Segmentation are applications in which of the following  |
| Option A: | Supervised Learning: Classification   |
| Option B: | Unsupervised Learning: Clustering   |
| Option C: | Unsupervised Learning: Regression   |
| Option D: | Reinforcement Learning  |
| 6.        | CART stands for...  |
| Option A: | classification and regression tree  |
| Option B: | choosing a regression task  |
| Option C: | classification and regression task  |
| Option D: | classification along regression task  |
| 7.        | Naïve Bayes Algorithm is a ..... learning algorithm.  |
| Option A: | Supervised  |
| Option B: | Reinforcement   |
| Option C: | Semi supervised   |
| Option D: | Unsupervised  |

|           |  |
|-----------|--|
| 8.        | Which of the following can only be used when training data are linearly separable? |
| Option A: | linear hard-margin svm   |
| Option B: | linear logistic regression   |
| Option C: | linear soft margin svm   |
| Option D: | the centroid method  |
| 9.        | Impact of high variance on the training set ?                                      |
| Option A: | depends upon the dataset   |
| Option B: | underfitting   |
| Option C: | both underfitting & overfitting  |
| Option D: | overfitting  |
| 10.       | What do you mean by a hard margin?   |
| Option A: | The SVM allows very low error in classification                                    |
| Option B: | The SVM allows very high error in classification                                   |
| Option C: | The SVM allows no error in classification  |
| Option D: | The SVM does not allow error in classification                                     |

|                                      |  |                      |
|--------------------------------------|--|----------------------|
| <b>Q2.</b><br><b>(20 Marks Each)</b> | <b>Solve any Two Questions out of Three</b>  | <b>10 marks each</b> |
| A                                    | Explain the steps of developing Machine Learning applications in detail.   |                      |
| B                                    | Explain regression line, scatter plot, error in prediction ; best fitting line.  |                      |
| C                                    | Cluster the following eight points (with (x, y) representing locations) into three clusters:<br>A1(2, 10), A2(2, 5), A3(8, 4), A4(5, 8), A5(7, 5), A6(6, 4), A7(1, 2), A8(4, 9)<br>Initial cluster centers are: A1(2, 10), A4(5, 8) and A7(1, 2).<br>The distance function between two points a = (x1, y1) and b = (x2, y2) is defined as-<br>$d(a, b) =  x_2 - x_1  +  y_2 - y_1 $<br>Use K-Means Algorithm to find the three cluster centers after the one iteration |                      |
| <b>Q3.</b><br><b>(20 Marks Each)</b> | <b>Solve any Two Questions out of Three</b>  | <b>10 marks each</b> |
| A                                    | Compare and contrast Linear and Logistic regressions with respect to their mechanisms of prediction.   |                      |
| B                                    | Explain in detail PCA for dimension reduction.   |                      |

| C                                    | <p>Find complete linkage method of hierarchical clustering to find clusters of 5 data points with following distance matrix.</p> <table border="1"> <tr> <th></th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> </tr> <tr> <th>1</th> <td>0</td> <td>9</td> <td>3</td> <td>6</td> <td>11</td> </tr> <tr> <th>2</th> <td>9</td> <td>0</td> <td>7</td> <td>5</td> <td>10</td> </tr> <tr> <th>3</th> <td>3</td> <td>7</td> <td>0</td> <td>9</td> <td>2</td> </tr> <tr> <th>4</th> <td>6</td> <td>5</td> <td>9</td> <td>0</td> <td>8</td> </tr> <tr> <th>5</th> <td>11</td> <td>10</td> <td>2</td> <td>8</td> <td>0</td> </tr> </table>   |         | 1         | 2   | 3         | 4 | 5         | 1     | 0   | 9 | 3    | 6      | 11  | 2 | 9   | 0     | 7  | 5 | 10   | 3      | 3   | 7 | 0         | 9      | 2   | 4 | 6      | 5     | 9   | 0 | 8    | 5   | 11  | 10 | 2      | 8      | 0  |   |     |        |    |    |     |     |    |    |      |       |     |    |        |     |    |
|--------------------------------------|--|---------|-----------|-----|-----------|---|-----------|-------|-----|---|------|--------|-----|---|-----|-------|----|---|------|--------|-----|---|-----------|--------|-----|---|--------|-------|-----|---|------|-----|-----|----|--------|--------|----|---|-----|--------|----|----|-----|-----|----|----|------|-------|-----|----|--------|-----|----|
|                                      | 1  | 2       | 3         | 4   | 5         |   |           |       |     |   |      |        |     |   |     |       |    |   |      |        |     |   |           |        |     |   |        |       |     |   |      |     |     |    |        |        |    |   |     |        |    |    |     |     |    |    |      |       |     |    |        |     |    |
| 1                                    | 0  | 9       | 3         | 6   | 11        |   |           |       |     |   |      |        |     |   |     |       |    |   |      |        |     |   |           |        |     |   |        |       |     |   |      |     |     |    |        |        |    |   |     |        |    |    |     |     |    |    |      |       |     |    |        |     |    |
| 2                                    | 9  | 0       | 7         | 5   | 10        |   |           |       |     |   |      |        |     |   |     |       |    |   |      |        |     |   |           |        |     |   |        |       |     |   |      |     |     |    |        |        |    |   |     |        |    |    |     |     |    |    |      |       |     |    |        |     |    |
| 3                                    | 3  | 7       | 0         | 9   | 2         |   |           |       |     |   |      |        |     |   |     |       |    |   |      |        |     |   |           |        |     |   |        |       |     |   |      |     |     |    |        |        |    |   |     |        |    |    |     |     |    |    |      |       |     |    |        |     |    |
| 4                                    | 6  | 5       | 9         | 0   | 8         |   |           |       |     |   |      |        |     |   |     |       |    |   |      |        |     |   |           |        |     |   |        |       |     |   |      |     |     |    |        |        |    |   |     |        |    |    |     |     |    |    |      |       |     |    |        |     |    |
| 5                                    | 11   | 10      | 2         | 8   | 0         |   |           |       |     |   |      |        |     |   |     |       |    |   |      |        |     |   |           |        |     |   |        |       |     |   |      |     |     |    |        |        |    |   |     |        |    |    |     |     |    |    |      |       |     |    |        |     |    |
| <b>Q4.</b><br><b>(20 Marks Each)</b> | <p><b>Solve any Two Questions out of Three</b> <span style="float: right;"><b>10 marks each</b></span></p>   |         |           |     |           |   |           |       |     |   |      |        |     |   |     |       |    |   |      |        |     |   |           |        |     |   |        |       |     |   |      |     |     |    |        |        |    |   |     |        |    |    |     |     |    |    |      |       |     |    |        |     |    |
| A                                    | <p>Explain K-mean clustering algorithm giving suitable example. Also, explain how K-mean clustering differs from hierarchical clustering.</p>  |         |           |     |           |   |           |       |     |   |      |        |     |   |     |       |    |   |      |        |     |   |           |        |     |   |        |       |     |   |      |     |     |    |        |        |    |   |     |        |    |    |     |     |    |    |      |       |     |    |        |     |    |
| B                                    | <p>What is support vector machine? What do you mean by support vectors, hyper plane and margin, support vectors? What will be the boundary for one dimensional data, two dimensional data and three dimensional data. Explain with suitable examples.</p>  |         |           |     |           |   |           |       |     |   |      |        |     |   |     |       |    |   |      |        |     |   |           |        |     |   |        |       |     |   |      |     |     |    |        |        |    |   |     |        |    |    |     |     |    |    |      |       |     |    |        |     |    |
|                                      | <p>What is SVM? Explain the following terms: hyperplane, separating hyperplane, margin and support vectors with suitable example.</p>  |         |           |     |           |   |           |       |     |   |      |        |     |   |     |       |    |   |      |        |     |   |           |        |     |   |        |       |     |   |      |     |     |    |        |        |    |   |     |        |    |    |     |     |    |    |      |       |     |    |        |     |    |
| C                                    | <p>Create a decision tree using gini index to classify following dataset:-</p> <table border="1"> <thead> <tr> <th>Sr. No.</th> <th>Income</th> <th>Age</th> <th>Own house</th> </tr> </thead> <tbody> <tr><td>1</td><td>Very high</td><td>Young</td><td>Yes</td></tr> <tr><td>2</td><td>High</td><td>Medium</td><td>Yes</td></tr> <tr><td>3</td><td>Low</td><td>Young</td><td>No</td></tr> <tr><td>4</td><td>High</td><td>Medium</td><td>Yes</td></tr> <tr><td>5</td><td>Very high</td><td>Medium</td><td>Yes</td></tr> <tr><td>6</td><td>Medium</td><td>Young</td><td>Yes</td></tr> <tr><td>7</td><td>High</td><td>Old</td><td>Yes</td></tr> <tr><td>8</td><td>Medium</td><td>Medium</td><td>No</td></tr> <tr><td>9</td><td>Low</td><td>Medium</td><td>No</td></tr> <tr><td>10</td><td>Low</td><td>Old</td><td>No</td></tr> <tr><td>11</td><td>High</td><td>Young</td><td>Yes</td></tr> <tr><td>12</td><td>Medium</td><td>Old</td><td>No</td></tr> </tbody> </table> | Sr. No. | Income    | Age | Own house | 1 | Very high | Young | Yes | 2 | High | Medium | Yes | 3 | Low | Young | No | 4 | High | Medium | Yes | 5 | Very high | Medium | Yes | 6 | Medium | Young | Yes | 7 | High | Old | Yes | 8  | Medium | Medium | No | 9 | Low | Medium | No | 10 | Low | Old | No | 11 | High | Young | Yes | 12 | Medium | Old | No |
| Sr. No.                              | Income   | Age     | Own house |     |           |   |           |       |     |   |      |        |     |   |     |       |    |   |      |        |     |   |           |        |     |   |        |       |     |   |      |     |     |    |        |        |    |   |     |        |    |    |     |     |    |    |      |       |     |    |        |     |    |
| 1                                    | Very high  | Young   | Yes       |     |           |   |           |       |     |   |      |        |     |   |     |       |    |   |      |        |     |   |           |        |     |   |        |       |     |   |      |     |     |    |        |        |    |   |     |        |    |    |     |     |    |    |      |       |     |    |        |     |    |
| 2                                    | High   | Medium  | Yes       |     |           |   |           |       |     |   |      |        |     |   |     |       |    |   |      |        |     |   |           |        |     |   |        |       |     |   |      |     |     |    |        |        |    |   |     |        |    |    |     |     |    |    |      |       |     |    |        |     |    |
| 3                                    | Low  | Young   | No        |     |           |   |           |       |     |   |      |        |     |   |     |       |    |   |      |        |     |   |           |        |     |   |        |       |     |   |      |     |     |    |        |        |    |   |     |        |    |    |     |     |    |    |      |       |     |    |        |     |    |
| 4                                    | High   | Medium  | Yes       |     |           |   |           |       |     |   |      |        |     |   |     |       |    |   |      |        |     |   |           |        |     |   |        |       |     |   |      |     |     |    |        |        |    |   |     |        |    |    |     |     |    |    |      |       |     |    |        |     |    |
| 5                                    | Very high  | Medium  | Yes       |     |           |   |           |       |     |   |      |        |     |   |     |       |    |   |      |        |     |   |           |        |     |   |        |       |     |   |      |     |     |    |        |        |    |   |     |        |    |    |     |     |    |    |      |       |     |    |        |     |    |
| 6                                    | Medium   | Young   | Yes       |     |           |   |           |       |     |   |      |        |     |   |     |       |    |   |      |        |     |   |           |        |     |   |        |       |     |   |      |     |     |    |        |        |    |   |     |        |    |    |     |     |    |    |      |       |     |    |        |     |    |
| 7                                    | High   | Old     | Yes       |     |           |   |           |       |     |   |      |        |     |   |     |       |    |   |      |        |     |   |           |        |     |   |        |       |     |   |      |     |     |    |        |        |    |   |     |        |    |    |     |     |    |    |      |       |     |    |        |     |    |
| 8                                    | Medium   | Medium  | No        |     |           |   |           |       |     |   |      |        |     |   |     |       |    |   |      |        |     |   |           |        |     |   |        |       |     |   |      |     |     |    |        |        |    |   |     |        |    |    |     |     |    |    |      |       |     |    |        |     |    |
| 9                                    | Low  | Medium  | No        |     |           |   |           |       |     |   |      |        |     |   |     |       |    |   |      |        |     |   |           |        |     |   |        |       |     |   |      |     |     |    |        |        |    |   |     |        |    |    |     |     |    |    |      |       |     |    |        |     |    |
| 10                                   | Low  | Old     | No        |     |           |   |           |       |     |   |      |        |     |   |     |       |    |   |      |        |     |   |           |        |     |   |        |       |     |   |      |     |     |    |        |        |    |   |     |        |    |    |     |     |    |    |      |       |     |    |        |     |    |
| 11                                   | High   | Young   | Yes       |     |           |   |           |       |     |   |      |        |     |   |     |       |    |   |      |        |     |   |           |        |     |   |        |       |     |   |      |     |     |    |        |        |    |   |     |        |    |    |     |     |    |    |      |       |     |    |        |     |    |
| 12                                   | Medium   | Old     | No        |     |           |   |           |       |     |   |      |        |     |   |     |       |    |   |      |        |     |   |           |        |     |   |        |       |     |   |      |     |     |    |        |        |    |   |     |        |    |    |     |     |    |    |      |       |     |    |        |     |    |