

E/IT/R2020-21 'C' scheme / Sem VI

Duration: 3hrs

9

[Max Marks:80]

- NB (1) Question No 1 is Compulsory.  
(2) Attempt any three questions out of the remaining five.  
(3) All questions carry equal marks.  
(4) Assume suitable data, if required and state it clearly.

- 1 Attempt any FOUR [20]  
a Differentiate Between Forward and Backward chaining  
b Compare different search techniques based on their time complexities.  
c What is a histogram? Can we perform univariate graphical analysis using histogram?  
d Explain various measures of the central tendencies of a statistical distribution.  
e State PEAS of automated taxi driver.  
f What are the different ways of knowledge representation?
- 2 a Can 1 liter water be measured using 10 liter and 4 liter jug? Justify. [10]  
b Compare Linear Regression Vs Logistics Regression with suitable diagrams and formulas. [10]
- 3 a State A\* algorithm and explain with example how A\* searching algorithm helps in finding the goal with optimal path. [10]  
b With respect to Quantitative data analysis explain following: [10]  
i. Measure of central tendencies  
ii. Measure of spread  
iii. Skewness and Kurtosis [10]
- 4 a 1. Marcus was a man.  
2. Marcus was a Pompeian.  
3. All Pompeians were Romans.  
4. Caesar was a ruler.  
5. All Pompeians were either loyal to Caesar or hated him.  
6. Every one is loyal to someone.  
7. People only try to assassinate rulers they are not loyal to.  
8. Marcus tried to assassinate Caesar.  
  
Was Marcus loyal to Casear? Solve using resolution. [10]  
b In detail, explain steps in the Data Science Project. [10]
- 5 a What are the different types of Machine Learning algorithms? Give example of each category. [10]  
b Can min-max be used for team games? Draw sample trees for 2 and 3 teams.

Paper / Subject Code: 89384 / AI and DS -1

TE/IT/R2020-21 'C' Scheme / Sem VI

- 6 a Consider you are performing ML for predicting housing prices you have trained [10]  
three models and following data summarizes the predicted house price by each  
model for 5 different trial runs.

| Model<br>Code | House Price Predicted (Lakh Rs) |         |         |         |         |
|---------------|---------------------------------|---------|---------|---------|---------|
|               | Trial 1                         | Trial 2 | Trial 3 | Trial 4 | Trial 5 |
| A             | 3.5                             | 3.4     | 3.8     | 3.5     | 3.4     |
| B             | 3.9                             | 3.8     | 3.7     | 3.9     | 3.6     |
| C             | 3.5                             | 3.3     | 3.6     | 3.5     | 3.8     |

Perform One way ANOVA F Test on this data and comment on whether the  
mean house price predicted by models A, B, C are same with level of  
significance 0.05. (Use of F Table is allowed)

- b What are the rules of conversion from predicate to CNF? Explain each rule with [10]  
proper example.

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(9)

Duration: 3hrs

[Max Marks:80]

- N.B. : (1) Question No 1 is Compulsory.  
 (2) Attempt any three questions out of the remaining five.  
 (3) All questions carry equal marks.  
 (4) Assume suitable data, if required and state it clearly.

- 1 Attempt any FOUR [20]
  - a Write comparison between Business Intelligence and Data Science
  - b What is rational agent? Explain with diagram.
  - c Explain what role is played by Correlation and Covariance in EDA?
  - d What are heuristic functions? Where are they used?
  - e What is Unification? Give example
  - f What is Skolemization? Explain Skolem constant and Skolem function
- 2 a Write a detailed note on Hypothesis Testing. What are type I and type II errors? [10]
  - b The law says that it is a crime for an American to sell weapons to hostile nations. The country Nono, an enemy of America, has some missiles, and all of its missiles were sold to it by Colonel West, who is American. [10]  
 Prove that Col. West is a criminal!
- 3 a Explain uniform cost search and best first search in detail with examples and compare. [10]
  - b Explain various stages in the Data analytics Lifecycle. [10]
- 4 a Explain SVM in detail. [10]
  - b Describe PEAS and also write down the PEAS representations for Medical diagnosis system. [10]
- 5 a Write in detail issues in machine learning. [10]
  - b Elaborate in detail the steps in developing a Machine Learning application with architectural diagram. [10]



Paper / Subject Code: 37314 / AI and DS - 1

9

- 6 a What are the different planning techniques? Explain with example.  
 b What do you mean by covariance and correlation? Explain the range of coefficients of correlation and covariance. Calculate COV(Observed Value1, Observed Value2) and CORRCOV(Observed Value1, Observed Value2) for following data. How do you interpret these values?

[10]

[10]

| Experiment No | Observed Value1 | Observed Value2 | Experiment No | Observed Value1 | Observed Value2 |
|---------------|-----------------|-----------------|---------------|-----------------|-----------------|
| 1             | 38              | 20              | 9             | 80              | 9               |
| 2             | 62              | 15              | 10            | 32              | 22              |
| 3             | 22              | 30              | 11            | 51              | 20              |
| 4             | 38              | 21              | 12            | 56              | 19              |
| 5             | 45              | 18              | 13            | 21              | 28              |
| 6             | 69              | 12              | 14            | 34              | 23              |
| 7             | 75              | 14              | 15            | 76              | 14              |
| 8             | 38              | 28              |               |                 |                 |

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TE / sem VI / IT / R-19-20 / G scheme / AI &amp; DS -1

⑥

Time: 3 Hrs

Maximum marks = 80

Note: 1) Question one is compulsory. Answer any 3 out of questions 2 to 6.  
2) Each sub question of questions 2 to 6 carries 10 marks

Q1. Solve any 4 out of 6, each question carries 5 marks.

- What is bidirectional search?
- Explain what role is played by Correlation and Covariance in EDA?
- What are the Different Types of Machine Learning?
- Draw and explain structure of rational agent
- Explain various measures of the central tendencies of distribution.
- What is the Difference between Univariate, Bivariate, and Multivariate analysis?

Q2 a. Explain the Confusion Matrix with respect to Machine Learning Algorithms. What is a False Positive and False Negative and how are they significant?

Q2 b. What is PEAS? State and explain PEAS of automated taxi driver.

Q3 a. In detail, explain steps in the Data Science Project.

Q3 b. Write a note on Hill climbing. Explain an application of it.

Q4 a. Given jugs of 4 and 9 litres measure 1 and 3 litres.

Q4 b. What are the steps of Exploratory Data Analysis?

Q5 a. What is ANOVA technique? Explain different types of ANOVA.

Q5 b. What are the different types of plans?

Q6 a. Explain Data Visualization and its importance in data analytics?

Q6 b. Consider you are performing ML for predicting housing prices you have trained three models and following data summarizes the predicted house price by each model for 5 different trial runs.

| Model Code | House Price Predicted (Lakh Rs) |         |         |         |         |
|------------|---------------------------------|---------|---------|---------|---------|
|            | Trial 1                         | Trial 2 | Trial 3 | Trial 4 | Trial 5 |
| A          | 3.5                             | 3.4     | 3.8     | 3.5     | 3.4     |
| B          | 3.9                             | 3.8     | 3.7     | 3.9     | 3.6     |
| C          | 3.5                             | 3.3     | 3.6     | 3.5     | 3.8     |

Perform One way ANOVA F Test on this data and comment on whether the mean house price predicted by models A, B, C are same with level of significance 0.05. (Use of F Table is allowed)

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|           |   |
|-----------|---|
| Q1.       | Choose the correct option for following questions. All the Questions are compulsory and carry equal marks <span style="float: right;">2 marks each</span> |
| 1.        | are the action making parts of an agent that takes in the input for the user.   |
| Option A: | Actuators   |
| Option B: | Sensors   |
| Option C: | Environments  |
| Option D: | Performance   |
| 2.        | ----- is optimal search algorithm in terms of heuristics  |
| Option A: | Min Max Algorithm   |
| Option B: | Depth Limited Search  |
| Option C: | Hill Climbing Algorithm   |
| Option D: | A* Algorithm  |
| 3.        | P in PEAS stands for  |
| Option A: | Performance Criteria  |
| Option B: | Performance Evaluation  |
| Option C: | Performance Measure   |
| Option D: | Performance Environment   |
| 4.        | ----- is called as greedy local search  |
| Option A: | Hill Climbing   |
| Option B: | DFS   |
| Option C: | BFS   |
| Option D: | Uniform cost  |
| 5.        | Backward Chaining and Forward Chaining in AI is   |
| Option A: | Goal-driven and Data-driven approach respectively   |
| Option B: | Bottom -Up and Top-down Approach respectively   |
| Option C: | Goes from fact to result and goes from result to fact respectively.   |
| Option D: | Uses "BFS" and "DFS" respectively   |
| 6.        | Identify the one which is not a type of learning  |
| Option A: | Reinforcement Learning  |
| Option B: | Semi Unsupervised Learning  |
| Option C: | Supervised Learning   |
| Option D: | Unsupervised Learning   |
| 7.        | Machine learning is a subset of which of the following  |
| Option A: | Artificial Intelligence   |
| Option B: | Deep Learning   |
| Option C: | Data Learning   |
| Option D: | Statistics  |
| 8.        | Which of the following is not a univariate graphical EDA technique?   |
| Option A: | Histograms  |



|           |   |
|-----------|---|
| Option B: | Box Plots   |
| Option C: | Stem and Leaf plots   |
| Option D: | Pair plots  |
| 9         | Which statistical tool should be used to test the equality of 3 or more population means? |
| Option A: | ANOVA   |
| Option B: | T-test  |
| Option C: | Chi-square test   |
| Option D: | Interval Estimation   |
| 10.       | Which is NOT the correct statement about the InterQuartile Range.                         |
| Option A: | The interquartile range tells you the spread of the middle half of your distribution.     |
| Option B: | $IQR = Q3 - Q1$   |
| Option C: | In boxplot upper whisker indicates $Q3$   |
| Option D: | In boxplot IQR is indicated by the edges of the rectangle                                 |

|    |  |               |
|----|--|---------------|
| Q2 |  | 10 marks each |
| A  | <p>Solve Resolution:</p> <ol style="list-style-type: none"> <li>All people that are not poor and are smart are happy.</li> <li>Those people that read are not stupid.</li> <li>John can read and is wealthy.</li> <li>Happy people have <del>exciting</del> lives. <i>existing life</i></li> </ol> <p>Can anyone be found with an exciting life?</p> |               |
| B  | What do you mean by EDA? Explain different categorizations of EDA. For each type of EDA explain 1 technique that belongs to it in detail.  |               |

|    |   |               |
|----|---|---------------|
| Q3 |   | 10 marks each |
| A  | Elaborate in detail the steps in developing a Machine Learning application with architectural diagram.  |               |
| B  | <ol style="list-style-type: none"> <li>Illustrate with diagram how Goal based agent works.</li> <li>Describe PEAS and also write down the PEAS representations for Automated car driver.</li> </ol> |               |

| Q4   |  |            |                                 |         |         |  |  |         |         |         |         |         |   |     |     |     |     |     |   |     |     |     |     |     |   |     |     |     |     |     |
|--|--|------------|---------------------------------|---------|---------|--|--|---------|---------|---------|---------|---------|---|-----|-----|-----|-----|-----|---|-----|-----|-----|-----|-----|---|-----|-----|-----|-----|-----|
| A  | Compare min max and alpha Beta pruning algorithms.   |            |                                 |         |         |  |  |         |         |         |         |         |   |     |     |     |     |     |   |     |     |     |     |     |   |     |     |     |     |     |
| B  | Consider you are performing ML for predicting housing prices you have trained three models and following data summarizes the predicted house price by each model for 5 different trial runs. |            |                                 |         |         |  |  |         |         |         |         |         |   |     |     |     |     |     |   |     |     |     |     |     |   |     |     |     |     |     |
| <table border="1"><thead><tr><th rowspan="2">Model Code</th><th colspan="5">House Price Predicted (Lakh Rs)</th></tr><tr><th>Trial 1</th><th>Trial 2</th><th>Trial 3</th><th>Trial 4</th><th>Trial 5</th></tr></thead><tbody><tr><td>A</td><td>3.5</td><td>3.4</td><td>3.8</td><td>3.5</td><td>3.4</td></tr><tr><td>B</td><td>3.9</td><td>3.8</td><td>3.7</td><td>3.9</td><td>3.6</td></tr><tr><td>C</td><td>3.5</td><td>3.3</td><td>3.6</td><td>3.5</td><td>3.8</td></tr></tbody></table> |  | Model Code | House Price Predicted (Lakh Rs) |         |         |  |  | Trial 1 | Trial 2 | Trial 3 | Trial 4 | Trial 5 | A | 3.5 | 3.4 | 3.8 | 3.5 | 3.4 | B | 3.9 | 3.8 | 3.7 | 3.9 | 3.6 | C | 3.5 | 3.3 | 3.6 | 3.5 | 3.8 |
| Model Code   | House Price Predicted (Lakh Rs)  |            |                                 |         |         |  |  |         |         |         |         |         |   |     |     |     |     |     |   |     |     |     |     |     |   |     |     |     |     |     |
|  | Trial 1  | Trial 2    | Trial 3                         | Trial 4 | Trial 5 |  |  |         |         |         |         |         |   |     |     |     |     |     |   |     |     |     |     |     |   |     |     |     |     |     |
| A  | 3.5  | 3.4        | 3.8                             | 3.5     | 3.4     |  |  |         |         |         |         |         |   |     |     |     |     |     |   |     |     |     |     |     |   |     |     |     |     |     |
| B  | 3.9  | 3.8        | 3.7                             | 3.9     | 3.6     |  |  |         |         |         |         |         |   |     |     |     |     |     |   |     |     |     |     |     |   |     |     |     |     |     |
| C  | 3.5  | 3.3        | 3.6                             | 3.5     | 3.8     |  |  |         |         |         |         |         |   |     |     |     |     |     |   |     |     |     |     |     |   |     |     |     |     |     |
| Perform One way ANOVA F Test on this data and comment on whether the mean house price predicted by models A, B, C are same with level of significance 0.05 (Use of F Table is allowed)   |  |            |                                 |         |         |  |  |         |         |         |         |         |   |     |     |     |     |     |   |     |     |     |     |     |   |     |     |     |     |     |

**University of Mumbai**  
Examinations summer 2022

AI and DS1

SEM VI IT

27/05/22

Corrections

Q1 is of 20 marks. Each subquestion is of 2 marks.

Answer any 2 in questions 2,3 and 4

| Q2 C | Compare Linear Regression Vs Logistics Regression with suitable diagrams and formulas.   |            |          |          |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |   |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |
|------|--|------------|----------|----------|---|----|----|---|----|----|---|----|----|---|----|----|---|----|----|---|----|----|---|----|----|---|----|----|---|----|---|---|----|----|---|----|----|---|----|----|---|----|----|---|----|----|---|----|----|
| Q3 C | What do you mean by covariance and correlation ? Explain what the range of coefficients of correlation and covariance suggest. Calculate COV(Age, Strength) and CORR(Age, Strength) for following data. How do you interpret these values?   |            |          |          |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |   |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |
|      | <table><tr><th>Subject ID</th><th>Age</th><th>Strength</th></tr><tr><td>A</td><td>38</td><td>20</td></tr><tr><td>B</td><td>62</td><td>15</td></tr><tr><td>C</td><td>22</td><td>30</td></tr><tr><td>D</td><td>38</td><td>21</td></tr><tr><td>E</td><td>45</td><td>18</td></tr><tr><td>F</td><td>69</td><td>12</td></tr><tr><td>G</td><td>75</td><td>14</td></tr><tr><td>H</td><td>38</td><td>28</td></tr><tr><td>I</td><td>80</td><td>9</td></tr><tr><td>J</td><td>32</td><td>22</td></tr><tr><td>K</td><td>51</td><td>20</td></tr><tr><td>L</td><td>56</td><td>19</td></tr><tr><td>M</td><td>21</td><td>28</td></tr><tr><td>N</td><td>34</td><td>23</td></tr><tr><td>O</td><td>76</td><td>14</td></tr></table> | Subject ID | Age      | Strength | A | 38 | 20 | B | 62 | 15 | C | 22 | 30 | D | 38 | 21 | E | 45 | 18 | F | 69 | 12 | G | 75 | 14 | H | 38 | 28 | I | 80 | 9 | J | 32 | 22 | K | 51 | 20 | L | 56 | 19 | M | 21 | 28 | N | 34 | 23 | O | 76 | 14 |
|      | Subject ID   | Age        | Strength |          |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |   |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |
|      | A  | 38         | 20       |          |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |   |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |
|      | B  | 62         | 15       |          |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |   |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |
|      | C  | 22         | 30       |          |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |   |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |
|      | D  | 38         | 21       |          |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |   |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |
|      | E  | 45         | 18       |          |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |   |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |
|      | F  | 69         | 12       |          |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |   |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |
|      | G  | 75         | 14       |          |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |   |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |
|      | H  | 38         | 28       |          |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |   |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |
|      | I  | 80         | 9        |          |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |   |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |
|      | J  | 32         | 22       |          |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |   |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |
|      | K  | 51         | 20       |          |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |   |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |
|      | L  | 56         | 19       |          |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |   |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |
|      | M  | 21         | 28       |          |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |   |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |
| N    | 34   | 23         |          |          |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |   |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |
| O    | 76   | 14         |          |          |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |   |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |
| Q4 C | i. Explain forward chaining and backward chaining algorithm with the help of example.  |            |          |          |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |   |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |
|      | ii. What is heuristic function? Which search algorithm types use it?   |            |          |          |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |   |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |   |    |    |

Correction in Q.2A) Q.4A)

|      |   |
|------|---|
| Q2 A | 4. Happy people have existing life.               |
| Q4 A | Compare min-max and alpha-beta pruning algorithms |

2:08pm