

**STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI 600 086**  
**(For candidates admitted from the academic year 2023 – 2024 )**  
**M. Sc. DEGREE EXAMINATION, NOVEMBER 2024**  
**BIOINFORMATICS**  
**FIRST SEMESTER**

**COURSE** : ELECTIVE  
**PAPER** : BIOMATHEMATICS AND BIOSTATISTICS  
**SUBJECT CODE** : 23BI/PE/BS15  
**TIME** : 3 HOURS

**MAX. MARKS: 100**

| Q. NO. | SECTION A<br>(10 X 1=10 MARKS)<br>ALL QUESTIONS TO BE ANSWERED (OBJECTIVE TYPE)   | CO  | KL |
|--------|---|-----|----|
| 1.     | The set O of odd positive integers less than 10 can be expressed by _____<br>a) {1, 2, 3}    b) {1, 3, 5, 7, 9}<br>c) {1, 2, 5, 9}                                        d) {1, 5, 7, 9, 11}                   | CO1 | K1 |
| 2.     | Find the complement of a set A when $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$ and $A = \{1, 3, 4\}$ .<br>a) {2, 5, 6, 7, 8, 9}                                  b) {2, 6, 7, 8, 9}<br>c) {2, 5, 6, 7, 8}                                     d) { 6, 7, 8, 9} | CO2 | K2 |
| 3.     | Two matrices A and B are multiplied to get AB if<br>a) both are rectangular<br>b) both have same order<br>c) no of columns of A is equal to columns of B<br>d) no of rows of A is equal to no of columns of B   | CO1 | K1 |
| 4.     | Let A and B be two matrices of same order, then state whether the given statement is true or false.<br>$A + B = B + A$<br>a) True     b) False  | CO2 | K2 |
| 5.     | The probability of event equal to zero is called;<br>a) Unsure event                                        b) Sure Event<br>c) Impossible event                                  d) Independent event  | CO1 | K1 |
| 6.     | If P(A) denotes the probability of an event A, then<br>a) $P(A) < 0$ b) $P(A) > 1$<br>c) $0 \leq P(A) \leq 1$ d) $-1 \leq P(A) \leq 1$  | CO2 | K2 |
| 7.     | Two types of research data include-<br>a) Recognised and unrecognised data<br>b) Structured and unstructured data<br>c) Qualitative and quantitative data<br>d) Organised and processed data  | CO1 | K1 |
| 8.     | Which of the following is not a one-dimensional diagram:<br>a) Simple bar diagram                                b) Multiple bar diagram<br>c) Component bar diagram                          d) Pie diagram  | CO2 | K2 |

|               |   |           |           |
|---------------|---|-----------|-----------|
| 9.            | What is the meaning of cluster sampling?<br>a) It is a process where the sampling universe is divided into multiple groups<br>b) It is a process where the samples for a study is obtained through conscious selection<br>c) It is a process where the samples for a study are selected at regular intervals<br>d) It is a process through which the sample for a study is divided into multiple groups | CO1       | K1        |
| 10.           | It is possible to _____ the magnitude of sampling error if we take a _____ sample.<br>a) Increase, smaller                      b) Decrease, larger<br>c) Decrease, smaller                      c) None of the above   | CO2       | K2        |
| <b>Q. No.</b> | <b>SECTION B                      (10 x 2= 20 marks)</b><br><b>ANSWERS IN ABOUT 50 WORDS</b>  | <b>CO</b> | <b>KL</b> |
| 11.           | If $A = \{1, 2, 3, 4\}$ , $B = \{3, 4, 5, 6\}$ , $C = \{5, 6, 7, 8\}$ . Find $A \cup B \cup C$ .  | CO3       | K3        |
| 12.           | The magnitude of the vector $6i + 2j + 3k$ is equal to:   | CO3       | K4        |
| 13.           | The matrix is given by, $A = \begin{bmatrix} 3 & -1 \\ 4 & 3 \end{bmatrix}$<br>Find the value of $ A $ .  | CO3       | K3        |
| 14.           | Give an example for square matrices.  | CO3       | K4        |
| 15.           | If $P(E) = 0.07$ , then what is the probability of 'not E'?   | CO3       | K3        |
| 16.           | State addition theorem of probability.  | CO3       | K4        |
| 17.           | Define histogram.   | CO3       | K3        |
| 18.           | Find the mean for the given data:<br>90, 94, 53, 68, 79, 94, 53, 65, 87, 90, 70, 69, 65, 89, 85, 53, 47, 61, 27, 80   | CO3       | K4        |
| 19.           | Differentiate probability and non-probability sampling.   | CO3       | K3        |
| 20.           | List the types of correlation.  | CO3       | K4        |
| <b>Q. No.</b> | <b>SECTION C                      (4 X 10= 40 MARKS)</b><br><b>ANSWER IN ABOUT 600 WORDS - INTERNAL CHOICE</b>  | <b>CO</b> | <b>KL</b> |
| 21.           | a) If $A = \{2, 3, 5, 7, 11, 13\}$ , $B = \{5, 7, 9, 11, 15\}$ are the subsets of $U = \{2, 3, 5, 7, 9, 11, 13, 15\}$ , verify De Morgan's laws.<br><b>OR</b><br>b) Write in detail on Binomial probability distributions with examples.  | CO3       | K4        |
| 22.           | a) Find the Inverse of the Following Matrix<br>$\begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 2 & 9 \end{pmatrix}$<br><b>OR</b><br>b) Find the cross product of the given two vectors.<br>$\vec{X} = 5\vec{i} + 6\vec{j} + 2\vec{k} \text{ and } \vec{Y} = \vec{i} + \vec{j} + \vec{k}$   | CO4       | K5        |

|                    |   |                |           |       |       |       |       |       |           |       |       |                    |   |   |    |     |    |   |   |   |   |       |       |       |       |       |       |       |       |                    |   |    |    |    |    |    |   |     |    |
|--------------------|---|----------------|-----------|-------|-------|-------|-------|-------|-----------|-------|-------|--------------------|---|---|----|-----|----|---|---|---|---|-------|-------|-------|-------|-------|-------|-------|-------|--------------------|---|----|----|----|----|----|---|-----|----|
| 23.                | <p>a) Consider the following frequency distribution. Calculate the mean weight of students.</p> <table border="1" data-bbox="336 226 1123 450"> <tr> <td>Weight (in kg)</td> <td>31-35</td> <td>36-40</td> <td>41-45</td> <td>46-50</td> <td>51-55</td> <td>56-60</td> <td>61-65</td> <td>66-70</td> <td>71-75</td> </tr> <tr> <td>Number of Students</td> <td>9</td> <td>6</td> <td>15</td> <td>3</td> <td>1</td> <td>2</td> <td>2</td> <td>1</td> <td>1</td> </tr> </table> <p style="text-align: center;"><b>OR</b></p> <p>b) Calculate the median marks of students from the following distribution.</p> <table border="1" data-bbox="336 562 1123 741"> <tr> <td>Marks</td> <td>10-20</td> <td>20-30</td> <td>30-40</td> <td>40-50</td> <td>50-60</td> <td>60-70</td> <td>70-80</td> </tr> <tr> <td>Number of Students</td> <td>7</td> <td>10</td> <td>10</td> <td>20</td> <td>20</td> <td>15</td> <td>8</td> </tr> </table> | Weight (in kg) | 31-35     | 36-40 | 41-45 | 46-50 | 51-55 | 56-60 | 61-65     | 66-70 | 71-75 | Number of Students | 9 | 6 | 15 | 3   | 1  | 2 | 2 | 1 | 1 | Marks | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 | 70-80 | Number of Students | 7 | 10 | 10 | 20 | 20 | 15 | 8 | CO3 | K4 |
| Weight (in kg)     | 31-35   | 36-40          | 41-45     | 46-50 | 51-55 | 56-60 | 61-65 | 66-70 | 71-75     |       |       |                    |   |   |    |     |    |   |   |   |   |       |       |       |       |       |       |       |       |                    |   |    |    |    |    |    |   |     |    |
| Number of Students | 9   | 6              | 15        | 3     | 1     | 2     | 2     | 1     | 1         |       |       |                    |   |   |    |     |    |   |   |   |   |       |       |       |       |       |       |       |       |                    |   |    |    |    |    |    |   |     |    |
| Marks              | 10-20   | 20-30          | 30-40     | 40-50 | 50-60 | 60-70 | 70-80 |       |           |       |       |                    |   |   |    |     |    |   |   |   |   |       |       |       |       |       |       |       |       |                    |   |    |    |    |    |    |   |     |    |
| Number of Students | 7   | 10             | 10        | 20    | 20    | 15    | 8     |       |           |       |       |                    |   |   |    |     |    |   |   |   |   |       |       |       |       |       |       |       |       |                    |   |    |    |    |    |    |   |     |    |
| 24.                | <p>a) Explain the types of regression equations.</p> <p style="text-align: center;"><b>OR</b></p> <p>b) Calculate the correlation coefficient for the following data:<br/> <math>X = 4, 8, 12, 16</math> and<br/> <math>Y = 5, 10, 15, 20</math>.</p>   | CO4            | K5        |       |       |       |       |       |           |       |       |                    |   |   |    |     |    |   |   |   |   |       |       |       |       |       |       |       |       |                    |   |    |    |    |    |    |   |     |    |
| <b>Q. No.</b>      | <p><b>SECTION D (2x 15=30 marks)</b></p> <p><b>ANSWER ANY TWO QUESTIONS IN ABOUT 1200 WORDS</b></p>   | <b>CO</b>      | <b>KL</b> |       |       |       |       |       |           |       |       |                    |   |   |    |     |    |   |   |   |   |       |       |       |       |       |       |       |       |                    |   |    |    |    |    |    |   |     |    |
| 25.                | <p>Write short notes on the following:</p> <p>a. Hardy-Weinberg Principle</p> <p>b. Chi square test</p>   | CO5            | K6        |       |       |       |       |       |           |       |       |                    |   |   |    |     |    |   |   |   |   |       |       |       |       |       |       |       |       |                    |   |    |    |    |    |    |   |     |    |
| 26.                | Explain relations and functions with example.   | CO5            | K6        |       |       |       |       |       |           |       |       |                    |   |   |    |     |    |   |   |   |   |       |       |       |       |       |       |       |       |                    |   |    |    |    |    |    |   |     |    |
| 27.                | <p>Calculate the mean, variance and standard deviation for the following data:</p> <table border="1" data-bbox="336 1265 1123 1377"> <tr> <td>Class Interval</td> <td>0-10</td> <td>10-20</td> <td>20-30</td> <td>30-40</td> <td>40-50</td> <td>50-60</td> </tr> <tr> <td>Frequency</td> <td>27</td> <td>10</td> <td>7</td> <td>5</td> <td>4</td> <td>2</td> </tr> </table>   | Class Interval | 0-10      | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | Frequency | 27    | 10    | 7                  | 5 | 4 | 2  | CO5 | K6 |   |   |   |   |       |       |       |       |       |       |       |       |                    |   |    |    |    |    |    |   |     |    |
| Class Interval     | 0-10  | 10-20          | 20-30     | 30-40 | 40-50 | 50-60 |       |       |           |       |       |                    |   |   |    |     |    |   |   |   |   |       |       |       |       |       |       |       |       |                    |   |    |    |    |    |    |   |     |    |
| Frequency          | 27  | 10             | 7         | 5     | 4     | 2     |       |       |           |       |       |                    |   |   |    |     |    |   |   |   |   |       |       |       |       |       |       |       |       |                    |   |    |    |    |    |    |   |     |    |
| 28.                | <p>State the difference between permutation and combinations. Solve if John has to make a group of 4 students in the class to represent the school in a science fair. There are total 15 students in the class. If a group should have four students, how many different combinations of groups John can make from a class of 15 students by picking 4 students at random?</p>  | CO5            | K6        |       |       |       |       |       |           |       |       |                    |   |   |    |     |    |   |   |   |   |       |       |       |       |       |       |       |       |                    |   |    |    |    |    |    |   |     |    |

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