STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI –600 086
(For candidates admitted during the academic year 2023 – 2024 & thereafter)

M.Sc. DEGREE EXAMINATION, APRIL 2026
BIOTECHNOLOGY
SECOND SEMESTER

COURSE : CORE
PAPER : RESEARCH METHODOLOGY
SUBJECT CODE : 23BY/PC/RM24
TIME : 3 HOURS MAX. MARKS: 100

Q. No.	SECTION A Answer ALL Questions (10 x 1 = 10 marks)	CO	KL
1	Define quantitative research.	1	1
2	State any one objective of research.	1	1
3	What do you mean by cross-reference in a research paper?	1	1
4	List any two components of a scientific report.	1	1
5	Recall variable.	1	1
6	The square root of variance is called _____	1	1
7	If all observations in a dataset are equal, then standard deviation is: (a) 1 (b) Maximum (c) Zero (d) Negative	1	1
8	The range of the dataset- 22, 25, 30, 28, 35 is: (a) 5 (b) 10 (c) 13 (d) 35	1	1
9	The t-test is mainly used to compare: (a) Proportions (b) Means (c) Variances (d) Frequencies	1	1
10	The probability of rejecting a true null hypothesis is called _____.	1	1
Q. No.	**SECTION – B** **Answer ALL Questions (5 x 2 = 10 marks)**	**CO**	**KL**
11	Explain the concept of research and its main types.	2	2
12	Define Proof reading.	2	2
13	How will you classify the data.	2	2
14	List out the measures of dispersion.	2	2
15	Differentiate alternative hypothesis and null hypothesis.	2	2
Q. No.	**SECTION - C** **Answer ALL Questions (4 x 10 = 40 marks)**	**CO**	**KL**
16	Illustrate the essential steps in data collection for research. **(OR)** Demonstrate how basic, applied, and experimental research can be used to address a given research problem.	3	3

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<table>
<tr><td>17</td><td>Construct the project proposal for research project in science and technology.
(OR)
Develop a protocol for preparing an effective poster presentation.</td><td>3</td><td>3</td></tr>
<tr><td>18</td><td>Calculate the median and mode for the following data.
<table>
<tr><th>Marks</th><th>No of Students</th></tr>
<tr><td>25-30</td><td>6</td></tr>
<tr><td>30-35</td><td>4</td></tr>
<tr><td>35-40</td><td>15</td></tr>
<tr><td>40-45</td><td>30</td></tr>
<tr><td>45-50</td><td>27</td></tr>
<tr><td>50-55</td><td>18</td></tr>
<tr><td>55-60</td><td>25</td></tr>
<tr><td>60-65</td><td>12</td></tr>
<tr><td>65-70</td><td>8</td></tr>
<tr><td>70-75</td><td>5</td></tr>
</table>
(OR)
Analyze the variants, standard deviation and coefficient of variation for the following data.
<table>
<tr><td>x</td><td>18.1</td><td>19.2</td><td>20.1</td><td>20.4</td><td>22.8</td><td>22.9</td><td>23.7</td><td>24.5</td><td>25.2</td><td>26.2</td></tr>
</table></td><td>4</td><td>4</td></tr>
<tr><td>19</td><td>Obtain the correlation coefficient given in the following data.
<table>
<tr><td>X</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr>
<tr><td>Y</td><td>13</td><td>14</td><td>15</td><td>17</td><td>16</td><td>20</td><td>18</td><td>19</td><td>22</td><td>21</td></tr>
</table>
|(OR)
The following data give the number of flowers and the number of seeds per plant in one of the varieties of lentil. Calculate the regression coefficient and find its significance.
<table>
<tr><td>No of flowers</td><td>16</td><td>18</td><td>20</td><td>19</td><td>23</td><td>17</td><td>15</td><td>22</td></tr>
<tr><td>No of Seeds</td><td>35</td><td>39</td><td>42</td><td>48</td><td>52</td><td>41</td><td>60</td><td>51</td></tr>
</table>
t value from table =2.45 (p =0.05); 3.71 (p =0.01)</td><td>4</td><td>4</td></tr>
<tr><td>Q. No.</td><td>SECTION – D
Answer ALL Questions (2 x 20 = 40 marks)</td><td>CO</td><td>KL</td></tr>
<tr><td>20</td><td>Analyze the concept of research. Examine the major types of research and explain the significance of research in scientific inquiry
(OR)
Describe the process of manuscript preparation and analyze the importance of cross-referencing, proof-reading, and plagiarism prevention in research writing.</td><td>5</td><td>5</td></tr>
</table>

21 Data recorded on seedling height (cm) of a pulse crop in gamma irradiation material are given below. Calculate the F value and conclude your result.

Replicates	Seedling height (cm		
	10 KR	20 KR	30 KR
1	12	15	13
2	18	13	11
3	23	18	19
4	14	12	10
5	20	11	16

Tabulated value of F at 1% level of significance with df (2,12) = 6.9

(OR)

a. In a survey of 200 families with 5 children each in a village the following result is obtained.

Girls	0	1	2	3	4	5	Total
Boys	5	4	3	2	1	0	
No of families	18	35	104	96	52	15	320

Test whether the result is consistent with the hypothesis that boy and girl child are equally probable.
Tabulated value of $\chi^2_{(0.05,5df)} = 11.07$

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b. Protein content in percentage for leaves of 10 potted plants was assessed before and after gamma irradiation and the following results are obtained.

Plant	Before exposure to gamma rays	After exposure to gamma rays
1	26	19
2	28	22
3	22	18
4	18	17
5	21	19
6	16	12
7	15	13
8	20	15
9	24	16
10	25	18

Find out whether gamma irradiation has any effect on leaf protein content of the plant.

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