

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 86
(For candidates admitted from the academic year 2023 – 2024)

B.COM. DEGREE EXAMINATION, NOVEMBER 2023
BRANCH – HONOURS
FIRST SEMESTER

COURSE : **MAJOR CORE**
PAPER : **STATISTICS FOR BUSINESS**
SUBJECT CODE : **23BH/MC/SB14**
TIME : **3 HOURS**

MAX. MARKS: 100

Q. No.	SECTION A (5 x 2 =10)	CO	KL												
	Answer all questions														
1	List out the components of Time Series.	1	1												
2	What is Null Hypothesis?	1	1												
3	Write the number of degrees of freedom for Chi-Square computed for 3 X 3 Contingency table.	1	1												
4	Find correlation coefficient, if the regression coefficients are $b_{xy} = 3/2$ & $b_{yx} = 1/2$.	1	1												
5	In a trivariate distribution, it is found that $r_{12} = 0.7$, $r_{13} = 0.61$, $r_{23} = 0.4$. Find the value of $r_{12.3}$.	1	1												
Q. No.	SECTION B (4 x 5 = 20)	CO	KL												
	Answer any 4 questions														
6	Explain the procedure for testing the Hypothesis.	1	2												
7	Find Karl Pearson's coefficient of correlation from the following data: Marks in Accountancy 48 35 17 23 47 Marks in Statistics 45 20 40 25 45	1	2												
8	From the following data, test if the difference between the variances is significant @ 5% level of significance. (Table value of F (7,9) @5% = 3.29) Sample A B Sample Size 8 10 Sum of squares of deviations from the mean 84.4 102.6	1	2												
9	A company keeps records of accidents. During a recent safety review, a random sample of 60 accidents was selected and classified by the day of the week on which they occurred. <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>DAY</th> <th>MON</th> <th>TUE</th> <th>WED</th> <th>THUR</th> <th>FRI</th> </tr> </thead> <tbody> <tr> <td>No. of accidents</td> <td style="text-align: center;">8</td> <td style="text-align: center;">12</td> <td style="text-align: center;">9</td> <td style="text-align: center;">14</td> <td style="text-align: center;">17</td> </tr> </tbody> </table> Test whether there is any evidence that accidents are more likely on some days than others. (Table of chi square for 4 df @ 5% level of significance = 9.488)	DAY	MON	TUE	WED	THUR	FRI	No. of accidents	8	12	9	14	17	1	2
DAY	MON	TUE	WED	THUR	FRI										
No. of accidents	8	12	9	14	17										
10	The sales of a commodity in tonnes varied from Jan 2022 to Dec 2022 as follows: 280 300 280 280 270 240 230 230 220 200 210 200 Fit a trend line by the method of semi-average.	1	2												

11	From the following data, Calculate Seasonal Indices: <table border="1"> <thead> <tr> <th rowspan="2">Year</th> <th colspan="4">Seasons</th> </tr> <tr> <th>I</th> <th>II</th> <th>III</th> <th>IV</th> </tr> </thead> <tbody> <tr> <td>2020</td> <td>37</td> <td>41</td> <td>33</td> <td>35</td> </tr> <tr> <td>2021</td> <td>37</td> <td>39</td> <td>36</td> <td>36</td> </tr> <tr> <td>2022</td> <td>40</td> <td>43</td> <td>33</td> <td>31</td> </tr> </tbody> </table>	Year	Seasons				I	II	III	IV	2020	37	41	33	35	2021	37	39	36	36	2022	40	43	33	31	1	2
Year	Seasons																										
	I	II	III	IV																							
2020	37	41	33	35																							
2021	37	39	36	36																							
2022	40	43	33	31																							
Q. No.	SECTION C (4 x 10 =40) Answer the following questions	CO	KL																								
12 a.	Calculate Karl Pearson's coefficient of correlation from the following data: <table border="1"> <tbody> <tr> <td>X</td> <td>6</td> <td>8</td> <td>12</td> <td>15</td> <td>18</td> <td>20</td> <td>24</td> <td>28</td> <td>31</td> </tr> <tr> <td>Y</td> <td>10</td> <td>12</td> <td>15</td> <td>15</td> <td>18</td> <td>25</td> <td>22</td> <td>26</td> <td>28</td> </tr> </tbody> </table>	X	6	8	12	15	18	20	24	28	31	Y	10	12	15	15	18	25	22	26	28	2	3				
X	6	8	12	15	18	20	24	28	31																		
Y	10	12	15	15	18	25	22	26	28																		
12 b.	In a trivariate distribution it was found that $r_{12} = 0.6$; $r_{13} = 0.7$; $r_{23} = 0.65$. Calculate (i) $R_{1,23}$ (ii) $R_{3,12}$ (iii) $R_{2,13}$	2	3																								
13 a.	Can vaccination be regarded as preventive measure of small pox as evidenced by the following data? "Of 1482 persons exposed to small pox in a locality of 368 in all were attacked. Of these 1482 persons, 343 were vaccinated and of these only 35 were attacked." Given the Chi square value @5% of significance for 1 df is 3.84.	2	3																								
13 b.	Two random samples drawn from normal populations. From the following data test whether the population variances are the same at 5% level. (Table value of F for (9,7) df @ 5% level = 3.68)	2	3																								
14 a.	Examine 5 yearly moving averages from the following data: <table border="1"> <tbody> <tr> <td>Year</td> <td>2000</td> <td>2001</td> <td>2002</td> <td>2003</td> <td>2004</td> <td>2005</td> <td>2006</td> <td>2007</td> </tr> <tr> <td>Income</td> <td>161</td> <td>127</td> <td>152</td> <td>143</td> <td>144</td> <td>167</td> <td>182</td> <td>179</td> </tr> </tbody> </table> <table border="1"> <tbody> <tr> <td>2008</td> <td>2009</td> <td>2010</td> </tr> <tr> <td>152</td> <td>163</td> <td>159</td> </tr> </tbody> </table>	Year	2000	2001	2002	2003	2004	2005	2006	2007	Income	161	127	152	143	144	167	182	179	2008	2009	2010	152	163	159	3	4
Year	2000	2001	2002	2003	2004	2005	2006	2007																			
Income	161	127	152	143	144	167	182	179																			
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152	163	159																									
14 b.	Fit a straight-line trend to the following data by the least squares method and Estimate the likely sales for the 2023.	3	4																								
	<table border="1"> <tbody> <tr> <td>Year</td> <td>2016</td> <td>2017</td> <td>2018</td> <td>2019</td> <td>2020</td> <td>2021</td> <td>2022</td> </tr> <tr> <td>Sales (Rs. Crores)</td> <td>20</td> <td>23</td> <td>22</td> <td>25</td> <td>26</td> <td>29</td> <td>30</td> </tr> </tbody> </table>	Year	2016	2017	2018	2019	2020	2021	2022	Sales (Rs. Crores)	20	23	22	25	26	29	30										
Year	2016	2017	2018	2019	2020	2021	2022																				
Sales (Rs. Crores)	20	23	22	25	26	29	30																				

<p>15 a.</p>	<p>You are given below the following information about advertisement and sales:</p> <table border="1"> <thead> <tr> <th>Particulars</th> <th>Advertisement Exp (X) Rs. in crores</th> <th>Sales (Y) Rs. in crores</th> </tr> </thead> <tbody> <tr> <td>Mean</td> <td>20</td> <td>120</td> </tr> <tr> <td>Standard Deviation</td> <td>5</td> <td>25</td> </tr> <tr> <td colspan="3">Correlation Coefficient $r = + 0.8$</td> </tr> </tbody> </table> <p>(i) Calculate the two regression equations. (ii) Find the likely sales when advertisement expenditure is Rs. 25 crores. (iii) What should be the advertisement budget if the company wants to attain sales target of 150 crores?</p> <p style="text-align: center;">(Or)</p>	Particulars	Advertisement Exp (X) Rs. in crores	Sales (Y) Rs. in crores	Mean	20	120	Standard Deviation	5	25	Correlation Coefficient $r = + 0.8$			<p>3</p>	<p>4</p>									
Particulars	Advertisement Exp (X) Rs. in crores	Sales (Y) Rs. in crores																						
Mean	20	120																						
Standard Deviation	5	25																						
Correlation Coefficient $r = + 0.8$																								
<p>15 b.</p>	<p>The simple correlation coefficients between variables X_1, X_2, X_3 are $r_{12} = 0.41, r_{13} = 0.71$ and $r_{23} = 0.50$. Calculate the partial correlation coefficients $r_{12.3}, r_{23.1}, r_{31.2}$</p>	<p>3</p>	<p>4</p>																					
<p>Q. No.</p>	<p>SECTION D (1 x 15 = 15)</p>	<p>CO</p>	<p>KL</p>																					
	<p>Answer any one question</p>																							
<p>16</p>	<p>The following table gives the yields of 15 samples of plot under three varieties of food.</p> <table border="1"> <thead> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>20</td> <td>18</td> <td>25</td> </tr> <tr> <td>21</td> <td>20</td> <td>28</td> </tr> <tr> <td>23</td> <td>17</td> <td>22</td> </tr> <tr> <td>16</td> <td>15</td> <td>28</td> </tr> <tr> <td>20</td> <td>25</td> <td>32</td> </tr> </tbody> </table> <p>Test using analysis of variance whether there is a significant difference in the average yield of seeds.</p>	A	B	C	20	18	25	21	20	28	23	17	22	16	15	28	20	25	32	<p>4</p>	<p>5</p>			
A	B	C																						
20	18	25																						
21	20	28																						
23	17	22																						
16	15	28																						
20	25	32																						
<p>17</p>	<p>Find the Multiple Linear Regression equation of X_1 on X_2 and X_3 from the data relating to three variables given below:</p> <table border="1"> <tbody> <tr> <td>X_1</td> <td>4</td> <td>6</td> <td>7</td> <td>9</td> <td>13</td> <td>15</td> </tr> <tr> <td>X_2</td> <td>15</td> <td>12</td> <td>8</td> <td>6</td> <td>4</td> <td>8</td> </tr> <tr> <td>X_3</td> <td>30</td> <td>24</td> <td>20</td> <td>14</td> <td>10</td> <td>4</td> </tr> </tbody> </table>	X_1	4	6	7	9	13	15	X_2	15	12	8	6	4	8	X_3	30	24	20	14	10	4	<p>4</p>	<p>5</p>
X_1	4	6	7	9	13	15																		
X_2	15	12	8	6	4	8																		
X_3	30	24	20	14	10	4																		

Q. No.	SECTION E (1 x 15 = 15) Compulsory Case Study	CO	KL
18	<p>A local ice cream parlor, Sweet Delights, offers a variety of flavors to its customers. The owner is interested in understanding the preferences of their customers to optimize their inventory and improve customer satisfaction. The parlor offers four different flavors: Vanilla, Chocolate, Strawberry, and Mint Chip. The owner wants to know if there is a significant difference in the preferences of customers based on their age groups: Kids, Teenagers, and Adults.</p> <p>Data Collection: Over the course of a month, the parlor recorded the ice cream flavor choices of 300 customers. The customers were categorized into three age groups: Kids (under 12 years), Teenagers (13-19 years), and Adults (20 years and above). The data collected is as follows:</p> <p>Vanilla: Kids (50), Teenagers (30), Adults (20) Chocolate: Kids (20), Teenagers (60), Adults (40) Strawberry: Kids (40), Teenagers (10), Adults (30) Mint Chip: Kids (10), Teenagers (20), Adults (50)</p> <p>Problem Statement: Using the chi-square test, analyze the data to determine if there is a significant association between customers' age groups and their ice cream flavor preferences at Sweet Delights.</p>	5	6
