

<p>K. J. Somaiya Institute of Engineering and Information Technology, Sion, Mumbai-22</p> <p>(Autonomous College Affiliated to University of Mumbai)</p> <p>End Semester Exam</p> <p>April - May 2022</p> <p>B.Tech Program: <u>Computer Engineering</u></p> <p>Examination: TY, Semester: VI</p> <p>Course Code: <u>1UCEDLC6051</u> and Course Name: <u>Quantitative Analysis</u></p> <p>Duration: 03 Hours Max. Marks: 60</p>														
<p>Instructions:</p> <p>(1) All questions are compulsory.</p> <p>(2) Draw neat diagrams wherever applicable.</p> <p>(3) Assume suitable data, if necessary.</p>														
		Max. Mark s	CO	BT Level										
Q. 1	Solve any six questions out of eight:	12												
i)	What are the Qualitative data collection methods	2	CO1	U										
ii)	What is sampling? Enlist the types of probability sampling.	2	CO2	U										
iii)	From the given table, calculate the mean square error (MSE) value. <table><tr><td>Actual Value</td><td>Predicted value</td></tr><tr><td>100</td><td>130</td></tr><tr><td>150</td><td>170</td></tr><tr><td>200</td><td>220</td></tr><tr><td>250</td><td>260</td></tr></table>	Actual Value	Predicted value	100	130	150	170	200	220	250	260	2	CO3	A
Actual Value	Predicted value													
100	130													
150	170													
200	220													
250	260													

iv)	Given $b_{yx} = 2.7$ and $b_{xy} = 0.3$. Calculate the value of coefficient of correlation (r).	2	CO3	A														
v)	If a company is manufacturing a product from 2001 to 2010 and earning the profits (in crores of rupees) as 10, 15, 13, 17, 12, 16, 17, 21, 20, 18 for the last 10 years respectively. Classify the given data.	2	CO1	A														
vi)	When does multicollinearity occur in multiple regression?	2	CO4	U														
vii)	Enlist the properties of point estimator, Describe any one.	2	CO5	U														
viii)	A medical trial is conducted to test whether or not a new medicine reduces cholesterol by 20%. State the null and alternative hypotheses. <i>For the given problem, formulate the null and alternative hypothesis only. For the given problem, formulate the null and alternative hypothesis only.</i>	2	CO6	A														
Q. 2	Solve any four questions out of six:	16																
i)	The following figures relate to the cost of construction of a house in Delhi : <table><tr><th>Item</th><th>Expenditure</th></tr><tr><td>Cement</td><td>20%</td></tr><tr><td>Steel</td><td>15%</td></tr><tr><td>Bricks</td><td>10%</td></tr><tr><td>Timber</td><td>18%</td></tr><tr><td>Labour</td><td>20%</td></tr><tr><td>Miscellaneous</td><td>17%</td></tr></table> Draw a pie chart for the data.	Item	Expenditure	Cement	20%	Steel	15%	Bricks	10%	Timber	18%	Labour	20%	Miscellaneous	17%	4	CO1	A
Item	Expenditure																	
Cement	20%																	
Steel	15%																	
Bricks	10%																	
Timber	18%																	
Labour	20%																	
Miscellaneous	17%																	
ii)	Compare Probability Sampling and Non probability sampling.	4	CO2	U														
iii)	Obtain the two lines of regression from the following data and estimate the blood pressure when are is 50 years. Can we also estimate the blood pressure of a	4	CO3	A,An														

	person aged 20 years on the basis of this regression equation?																													
	<table><tr><td>Age (in years)</td><td>56</td><td>42</td><td>72</td><td>39</td><td>63</td><td>47</td><td>52</td><td>49</td><td>40</td><td>42</td><td>68</td><td>60</td></tr><tr><td>Blood Pressure</td><td>127</td><td>112</td><td>140</td><td>118</td><td>129</td><td>116</td><td>130</td><td>125</td><td>115</td><td>120</td><td>135</td><td>133</td></tr></table>	Age (in years)	56	42	72	39	63	47	52	49	40	42	68	60	Blood Pressure	127	112	140	118	129	116	130	125	115	120	135	133			
Age (in years)	56	42	72	39	63	47	52	49	40	42	68	60																		
Blood Pressure	127	112	140	118	129	116	130	125	115	120	135	133																		
iv)	<p>In a Trivariate population of random variables X_1, X_2, X_3. The following results about mean, S.D and correlation coefficient were found in a sample of size 20, Find the regression equation of X_1 on X_2 and X_3</p> <p>$\bar{x}_1 = 40, \bar{x}_2 = 50, \bar{x}_3 = 60$ $s_1 = 3, s_2 = 4, s_3 = 5$ $r_{12} = 0.6, r_{13} = 0.5, r_{23} = 0.4$</p>	4	CO4	A																										
v)	An unfair coin is flipped 100 times and 61 heads are observed. The coin either has probability $1/3, 1/2$ or $2/3$ of flipping of head each time it is flipped. find the maximum likelihood estimation.	4	CO5	A																										
vii)	Explain in brief: Type I and Type II errors in hypothesis.	4	CO6	U																										
Q. 3	Solve any two questions out of three:	16																												
i)	<p>Draw a suitable representative diagram for the following data.</p> <table><tr><td>Year</td><td>Sales ('00)</td><td>Gross Profit ('00)</td><td>Net Profit ('00)</td></tr><tr><td>1980</td><td>200</td><td>30</td><td>10</td></tr><tr><td>1981</td><td>210</td><td>40</td><td>20</td></tr><tr><td>1982</td><td>220</td><td>75</td><td>30</td></tr><tr><td>1983</td><td>230</td><td>60</td><td>30</td></tr></table>	Year	Sales ('00)	Gross Profit ('00)	Net Profit ('00)	1980	200	30	10	1981	210	40	20	1982	220	75	30	1983	230	60	30	8	CO1	A, An						
Year	Sales ('00)	Gross Profit ('00)	Net Profit ('00)																											
1980	200	30	10																											
1981	210	40	20																											
1982	220	75	30																											
1983	230	60	30																											
ii)	<p>In a correlation study, the following values are obtained:</p> <table><tr><td></td><td>X</td><td>Y</td></tr><tr><td>Mean</td><td>20</td><td>120</td></tr><tr><td>S.D.</td><td>5</td><td>25</td></tr><tr><td colspan="3">Coefficient of correlation (r) = 0.8</td></tr></table> <p>Find the two regression equations that are associated with the above values. What will be the possible value of Y when X is 25?</p>		X	Y	Mean	20	120	S.D.	5	25	Coefficient of correlation (r) = 0.8			8	CO3	A, An														
	X	Y																												
Mean	20	120																												
S.D.	5	25																												
Coefficient of correlation (r) = 0.8																														

iii)	Derive the likelihood equation for estimating the parameters.	8	CO5	A																					
Q. 4	Solve any two questions out of three:	16																							
i)	<p>For the following population, consider all possible SRSWOR samples of size 3.</p> <table><tr><td>i</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr><tr><td>Y_i</td><td>5</td><td>8</td><td>3</td><td>11</td><td>9</td></tr></table> <p>a) Show that \bar{y} is an unbiased estimator of \bar{Y} b) Show that s^2 is an unbiased estimator of S^2 c) Calculate the sampling variance of \bar{y} and show that it agrees with the formula $\left(\frac{N-n}{nN}\right) S^2$ d) Verify that $\text{Var}_{\text{SRSWR}}(\bar{y}) \geq \text{Var}_{\text{SRSWOR}}(\bar{y})$</p>	i	1	2	3	4	5	Y_i	5	8	3	11	9	8	CO2	A,An									
i	1	2	3	4	5																				
Y_i	5	8	3	11	9																				
ii)	<p>Fit a regression equation to estimate β_0, β_1, and β_2 to the following data of a transport company on the weights of 6 shipments, the distances they were moved, and the damage of goods that was incurred.</p> <table><tr><td>Weight X_1 (1000 kg)</td><td>4.0</td><td>3.0</td><td>1.6</td><td>1.2</td><td>3.4</td><td>4.8</td></tr><tr><td>Distance X_2 (100 km)</td><td>1.5</td><td>2.2</td><td>1.0</td><td>2.0</td><td>0.8</td><td>1.6</td></tr><tr><td>Damage Y (Rs.)</td><td>160</td><td>112</td><td>69</td><td>90</td><td>123</td><td>186</td></tr></table> <p>Estimate the damage when a shipment of 3700 kg is moved to a distance of 260 km.</p>	Weight X_1 (1000 kg)	4.0	3.0	1.6	1.2	3.4	4.8	Distance X_2 (100 km)	1.5	2.2	1.0	2.0	0.8	1.6	Damage Y (Rs.)	160	112	69	90	123	186	8	CO4	A
Weight X_1 (1000 kg)	4.0	3.0	1.6	1.2	3.4	4.8																			
Distance X_2 (100 km)	1.5	2.2	1.0	2.0	0.8	1.6																			
Damage Y (Rs.)	160	112	69	90	123	186																			
iii)	<p>A machine is designed to produce insulating washers for electrical devices of average thickness of 0.025 cm. A random sample of 10 washers was found to have an average thickness of 0.024 cm with a standard deviation of 0.002 cm. Test the significance of the deviation. Value of t for 9 degrees of freedom at 5% level is 2.262.</p>	8	CO6	A																					