



# Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058, India  
(Autonomous College Affiliated to University of Mumbai)

## End Semester Examination

May - 2024

Max. Marks: 100

Class: MCA

Course Code: MA503

Name of the Course: Probability & Statistics

Duration: 3 Hrs

Semester: II

~~Branch: Computer / IT~~

### Instructions:

- (1) All questions are compulsory.
- (2) Assume suitable data if necessary.
- (3) Use of a scientific calculator is allowed.

Q NO.		Max Marks	CO	BL																										
Q. 1	(A) Construct the more than cumulative frequency table and draw the Ogive for the below-given data. <table><tr><td>Marks</td><td>1-10</td><td>11-20</td><td>21-30</td><td>31-40</td><td>41-50</td><td>51-60</td><td>61-70</td><td>71-80</td></tr><tr><td>Frequency</td><td>3</td><td>8</td><td>12</td><td>14</td><td>10</td><td>6</td><td>5</td><td>2</td></tr></table>	Marks	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	Frequency	3	8	12	14	10	6	5	2	07	CO1	2								
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Frequency	3	8	12	14	10	6	5	2																						
	(B) Find the median for the following data: <table><tr><td>Monthly Sales</td><td>Frequency</td></tr><tr><td>100-120</td><td>15</td></tr><tr><td>120-140</td><td>35</td></tr><tr><td>140-160</td><td>50</td></tr><tr><td>160-180</td><td>60</td></tr><tr><td>180-200</td><td>30</td></tr><tr><td>200-220</td><td>10</td></tr></table> <p style="text-align: center;"><b>OR</b></p> Find the Standard deviation for the following data: <table><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></tr><tr><td>Frequency</td><td>11</td><td>15</td><td>25</td><td>12</td><td>7</td></tr></table>	Monthly Sales	Frequency	100-120	15	120-140	35	140-160	50	160-180	60	180-200	30	200-220	10	Class Interval	0-10	10-20	20-30	30-40	40-50	Frequency	11	15	25	12	7	07		1
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Frequency	11	15	25	12	7																									
	(C) Draw a Box-Whisker plot for the number of books taken out of the library per month by first year students. The data is given as follows: 3, 0, 12, 0, 2, 0, 13, 0, 7, 5, 5, 2, 1, 1, 2.	08		2																										



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Q. 2	<p>(A) Ten students got the following percentage of marks in Economics &amp; Statistics:</p> <table> <tr><th>Roll No.</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th><th>10</th></tr> <tr><th>Marks in Economics</th><td>78</td><td>36</td><td>98</td><td>25</td><td>75</td><td>82</td><td>90</td><td>62</td><td>65</td><td>39</td></tr> <tr><th>Marks in Statistics</th><td>84</td><td>51</td><td>91</td><td>60</td><td>68</td><td>62</td><td>86</td><td>58</td><td>53</td><td>47</td></tr> </table> <p>Calculate the Karl Pearson's Coefficient of Correlation.</p> <p>(B) Find the regression line of <math>Y</math> on <math>X</math> for the following data:</p> <table> <tr><th><math>X</math></th><td>1</td><td>3</td><td>4</td><td>6</td><td>8</td><td>9</td><td>11</td><td>14</td></tr> <tr><th><math>Y</math></th><td>1</td><td>2</td><td>4</td><td>4</td><td>5</td><td>7</td><td>8</td><td>9</td></tr> </table> <p>Estimate the value of <math>Y</math>, when <math>X = 10</math>.</p> <p>(C) Compute the Spearman's Rank Correlation Coefficient <math>r</math> for the following data:</p> <table> <tr><th>Person</th><th>A</th><th>B</th><th>C</th><th>D</th><th>E</th><th>F</th><th>G</th><th>H</th><th>I</th><th>J</th></tr> <tr><th>Rank in Statistics</th><td>9</td><td>10</td><td>6</td><td>5</td><td>7</td><td>2</td><td>4</td><td>8</td><td>1</td><td>3</td></tr> <tr><th>Rank in Income</th><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> </table>	Roll No.	1	2	3	4	5	6	7	8	9	10	Marks in Economics	78	36	98	25	75	82	90	62	65	39	Marks in Statistics	84	51	91	60	68	62	86	58	53	47	$X$	1	3	4	6	8	9	11	14	$Y$	1	2	4	4	5	7	8	9	Person	A	B	C	D	E	F	G	H	I	J	Rank in Statistics	9	10	6	5	7	2	4	8	1	3	Rank in Income	1	2	3	4	5	6	7	8	9	10	07	CO2	2
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Q. 3	<p>(A) The sample of 6 persons in an office revealed an average daily smoking of 10, 12, 8, 9, 16, 5 cigarettes. The average level of smoking in the whole office has to be estimated at 90% level of confidence. (Given: <math>t = \pm 2.015</math> for 5% level of significance)</p> <p style="text-align: center;"><b>OR</b></p> <p>Two independent samples of 8 and 7 items respectively has the following values of the variables (weight in ounces):  Sample 1: 9, 11, 13, 11, 15, 9, 12, 14  Sample 2: 10, 12, 10, 14, 9, 8, 10  Is the difference between the means significant?  (Given: <i>degrees of freedom</i> = 13, <math>t_{0.05} = 2.16</math>)</p> <p>(B) From the following table, showing the number of plants having certain characteristics. Use <math>\chi^2</math> test to test the hypothesis that the flower color is independent of the flatness of the leaf. (Given: <i>degrees of freedom</i> = 1 at 0.9 level of significance, <math>\chi^2_{0.9} = 0.016</math>)</p> <table> <tr><th></th><th>Flat Leaves</th><th>Curled Leaves</th><th>Total</th></tr> <tr><td>White Flowers</td><td>99</td><td>36</td><td>135</td></tr> <tr><td>Red Flowers</td><td>20</td><td>5</td><td>25</td></tr> <tr><td>Total</td><td>119</td><td>41</td><td>160</td></tr> </table> <p>(C) Suppose a researcher claims that a mean average weight of men is greater than 100 kgs with standard deviation of 15 kgs. 30 Men are chosen with an average weight of 112.5 kgs. using hypothesis testing, check if there is enough evidence to support the researcher's claim. The</p>		Flat Leaves	Curled Leaves	Total	White Flowers	99	36	135	Red Flowers	20	5	25	Total	119	41	160	07  <																																																																						
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	confidence interval is given as 95%. (Given: the value of Z at 5% level of significance is 1.645)											
Q. 4	<p>(A) The probability that machine A will be performing an usual function in 5 years' time is <math>\frac{1}{4}</math>, while the probability that machine B will still be operating usefully at the end of the same period is, <math>\frac{1}{3}</math>. Find the probability in the following cases that in 5 years time:</p> <p>(i) Both machines will be performing usual function. (ii) Neither will be operating. (iii) Only machine B will be operating.</p> <p style="text-align: center;"><b>OR</b></p> <p>Let <math>X</math> be a random variable with the probability mass function given as follows:</p> <table><tr><td><math>X</math></td><td>0</td><td>1</td><td>2</td></tr><tr><td><math>P(X = x)</math></td><td><math>2k^2 + k - 3</math></td><td><math>6k</math></td><td><math>8k^2 + 2k + 3</math></td></tr></table> <p>Find the value of <math>k</math>.</p> <p>(B) The diameter of an electric cable is assumed to be continuous random variable with probability density function: <math>f(x) = 6x(1 - x)</math>, <math>0 \leq x \leq 1</math>. (i) Verify that above is <i>p. d. f.</i> (ii) Find the mean and variance.</p>	$X$	0	1	2	$P(X = x)$	$2k^2 + k - 3$	$6k$	$8k^2 + 2k + 3$	06	CO4	2
$X$	0	1	2									
$P(X = x)$	$2k^2 + k - 3$	$6k$	$8k^2 + 2k + 3$									
Q. 5	<p>(A) In a bolt factory, machines A, B and C manufacture respectively 25%, 35% and 40% of the total. Their output 5%, 4% and 2% are defective bolts. A bolt is drawn at a random from the product and is found to be defective. What is the probability that it is manufactured by machine B?</p> <p>(B) Find the area under the normal curve in each of the cases: (i) <math>Z = -0.46</math> and <math>Z = 2.21</math>      (ii) <math>Z = 0.81</math> and <math>Z = 1.94</math> (Given: the value of Z at 0.46 is 0.1772, the value of Z at 2.21 is 0.4865 the value of Z at 0.81 is 0.2910 the value of Z at 1.94 is 0.4738)</p>	06	CO5	2								
Q. 6	<p>(A) Let <math>X</math> and <math>Y</math> be two jointly continuous random variables with joint probability density function (joint <i>p. d. f.</i>)</p> $f_{X,Y}(x,y) = \begin{cases} x + \frac{3}{2}y^2, & 0 \leq x \leq 1, 0 \leq y \leq 1 \\ 0, & \text{otherwise} \end{cases}$ <p>Find the marginal pdfs <math>f_X(x)</math> and <math>f_Y(y)</math>.</p>	08	CO6	2								

----- ALL THE BEST -----