



Attempt any five questions

## Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (W), Mumbai : 400058, India

(Autonomous College of Affiliated to University of Mumbai)

### End Semester Examination

December 2022

Maxi Marks : 100

Class : FYMCA

Course code: MA503

Name of the course : Probability and Statistics

Duration : 3 hours

Semester : I

Branch : MCA

Instructions: (1) Attempt any FIVE questions. (2) Use of non-programmable scientific calculator is allowed. (3) Assume any necessary data but justify the same.

Q.N		Marks	CO	BL																						
1.(A)	The following data shows the distribution of 100 families according to their expenditure per week. Number of families corresponding the expenditure group (10-20) and (30-40) are missing from the data. The mode of the distribution is Rs. 24. Find the missing frequencies. <table border="1"><tr><td>Expenditure per week (Rs.)</td><td>0-10</td><td>10-20</td><td>20-30</td><td>30-40</td><td>40-50</td></tr><tr><td>No of families</td><td>14</td><td>--</td><td>27</td><td>--</td><td>15</td></tr></table>	Expenditure per week (Rs.)	0-10	10-20	20-30	30-40	40-50	No of families	14	--	27	--	15	[10]	1	2										
Expenditure per week (Rs.)	0-10	10-20	20-30	30-40	40-50																					
No of families	14	--	27	--	15																					
(B)	From the following frequency distribution of marks of students in an examination, calculate the Bowley's coefficient of skewness. <table border="1"><tr><td>Marks less than</td><td>10</td><td>20</td><td>30</td><td>40</td><td>50</td></tr><tr><td>No of students</td><td>5</td><td>12</td><td>32</td><td>44</td><td>50</td></tr></table>	Marks less than	10	20	30	40	50	No of students	5	12	32	44	50	[10]	1	2										
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No of students	5	12	32	44	50																					
2.(A)	The regression line of y on x for a certain bivariate data is $5y+3x=52$ and the line of regression of x on y is $2x+y=30$ . Find (i) Arithmetic mean of x and y. (ii) The coefficient of correlation between x and y. (iii) The most probable value of y when $x=10$ .	[10]	2	2																						
(B)	Find Spearman's rank correlation coefficient for the following data. <table border="1"><tr><td>Height of father (X )</td><td>68</td><td>64</td><td>75</td><td>50</td><td>64</td><td>80</td><td>75</td><td>40</td><td>55</td><td>64</td></tr><tr><td>Height of son (Y)</td><td>62</td><td>58</td><td>68</td><td>45</td><td>81</td><td>60</td><td>68</td><td>48</td><td>50</td><td>70</td></tr></table>	Height of father (X )	68	64	75	50	64	80	75	40	55	64	Height of son (Y)	62	58	68	45	81	60	68	48	50	70	[10]	2	2
Height of father (X )	68	64	75	50	64	80	75	40	55	64																
Height of son (Y)	62	58	68	45	81	60	68	48	50	70																
3.(A)	The following table gives the number of accidents in a city during 10 days of time. Find whether the accidents are uniformly distributed over that period. <table border="1"><tr><td>Day</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>Number of accidents</td><td>8</td><td>8</td><td>10</td><td>9</td><td>12</td><td>8</td><td>10</td><td>14</td><td>10</td><td>11</td></tr></table> [Given for 9 degrees of freedom at 5% level of significance, the table value of $\chi^2$ is 16.9]	Day	1	2	3	4	5	6	7	8	9	10	Number of accidents	8	8	10	9	12	8	10	14	10	11	[10]	2	3
Day	1	2	3	4	5	6	7	8	9	10																
Number of accidents	8	8	10	9	12	8	10	14	10	11																
(B)	A random sample of 100 students gave mean weight of 58 kg. with a s.d. of 4 kg. Test the hypothesis that the mean weight in the population is 60 kg. Use 1% level of significance. [Give at 1% level of significance $z_{\alpha}=2.58$ ]	[10]	2	3																						
4.(A)	There are 3 boxes. Box I contains 1 white, 2 red and 3 black balls. Box II contains 2 white, 3 red and 1 black balls. Box III contains 3 white, 1 red and 2 black balls. A box is chosen at random and two balls are drawn from it. They happen to be red and white. What is the probability that they come from Box II?	[10]	3	2																						

(B)	The probability that a certain film gets award for its story is 0.23, it will get award for its music is 0.15 and it will get award for both is 0.07. What is the probability that film will get award for (a) at least one of the two. (b) exactly one of the two.	[10]	3	2
5.(A)	If hens of a certain breed lay eggs on 5 days a week on an average; find on how many days during a season of 100 days, a poultry keeper with 5 hens of this breed, will expect to receive at least 4 eggs?	[10]	4	2
(B)	A calculator operates on two 1.5 volts batteries (for a total of 3 volts). The actual voltage of a battery is normally distributed with $\mu=1.5$ and $\sigma^2=0.045$ . The tolerance in the design of the calculator is such that it will not operate satisfactorily if the total voltage falls outside the range (2.70, 3.30) volts. What is the probability that the calculator will function correctly? [Given $P(0 \leq Z \leq 1) = 0.3413$ ]	[10]	4	2
6.(A)	Two random variables X and Y have the following joint p.d.f. $f(x,y) = k(4-x-y) \quad 0 \leq x \leq 2, 0 \leq y \leq 2$ $= 0 \quad \text{elsewhere}$ Find k and find the Marginal densities of X and Y.	[10]	3	2
(B)	Let X be a random variable for which $E(X)=24$ and $V(X)=16$ . Find the values of a and b such that $Y=aX-b$ has expectation zero and variance 2.	[10]	3	2

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