Q. 1  
   a) Explain, with Suitable Examples, (specific to Insurance Industry), ‘Discrete Variables and Continuous Variables.’  
   b) Write a Short Note on ‘Relative Dispersion or Coefficient of Variation’, clearly stating the situations where it is useful.  
   c) Explain ‘Chebyshev’s Theorem’ about Interpretation and Use of Standard Deviation.  
   d) Write a Short Note on ‘Advantages of Sampling’.  

Q. 2  
   A survey of 1,000 Life Assurance Agents in Bengaluru revealed the Product Preference as:  
   1) 658 Agents had the Preference for Assurance Products.  
   2) 372 Agents had the Preference for Pension Products.  
   3) 590 Agents had the Preference for Health-Insurance Products.  
   4) 166 Agents had the Preference for Assurance Products and Pension Products.  
   5) 434 Agents had the Preference for Assurance Products and Health-Insurance Products.  
   6) 126 Agents had the Preference for Pension Products and Health-Insurance Products.  
   
   a) Draw the Venn Diagram to depict the Results of the above Survey.  
   b) Determine the Number and Probability of Agents selling all Three Products: Assurance, Pension and Health-Insurance.  
   c) Determine the Numbers and Probabilities of Agents selling Only Two Products: Assurance and Pension (but, Not Health-Insurance), Assurance and Health-Insurance (but, Not Pension), Pension and Health-Insurance (but, Not Assurance).  
   d) Determine the Numbers and Probabilities of Agents selling Only One Product: Assurance, Pension, or Health-Insurance.  

Q. 3  
   A Divisional Office of a Life Assurance Company controls 10 Branch Offices, all in a certain Metro-City. All Branch Offices are expected to procure the New Business of 10,000 New Lives with Annualized First Premium of Rupees 10 Crores, in the Current Financial Year: 2013-2014. In the Last Financial Year: 2012-2013, only 4 Branch Offices could procure the then Expected New Business. The Probability of a Branch Office not procuring the expected New Business in the Current Financial Year: 2013-2014, is assumed to be the same as the Last Financial Year: 2012-2013.  
   1. Find the Probability Distribution.  
   2. Find the Probability that Maximum 2 Branch Offices does not procure the Expected New Business.  
   3. Find the Probability that Minimum 3 Branch Offices does not procure the Expected New Business.  
   (Hint : Random Variable is Number of Branch Offices not procuring the Expected New Business.)
New Business

b) A Box contains 25 Mobile Hand-Set{s} of similar make and model, of which, 10 are reported to be Defective and 15 are Non-Defective. 5 Mobile Hand-Sets are randomly picked-up, one after another (that is, without replacement).
1. What is the Probability that None of the 5 Mobile Hand-Sets are Defective?
2. What is the Probability that Exactly One of the 5 Mobile Hand-Sets is Defective?
3. What is the Probability that All of the 5 Mobile Hand-Sets are Defective?
4. What is the Probability that Minimum One of the 5 Mobile Hand-Sets is Defective?

Q. 4 a) Given below are number of fire policies issued in a small branch of a General Insurance Company.

<table>
<thead>
<tr>
<th>Year</th>
<th>Policies</th>
</tr>
</thead>
<tbody>
<tr>
<td>1975</td>
<td>77</td>
</tr>
<tr>
<td>1976</td>
<td>88</td>
</tr>
<tr>
<td>1977</td>
<td>94</td>
</tr>
<tr>
<td>1978</td>
<td>85</td>
</tr>
<tr>
<td>1979</td>
<td>91</td>
</tr>
<tr>
<td>1980</td>
<td>98</td>
</tr>
<tr>
<td>1981</td>
<td>90</td>
</tr>
</tbody>
</table>

1. Fit a straight line trend by method of Least Squares and obtain trend values.
2. What are the trend values for 1982 & 1985?
3. Eliminate trend by using multiplicative model.

b) In a box, there are six bangles of which m are red and the rest are green. It is known that the number of red bangles is either 3 or 4. However, exact number is not known. (m=3, more likely). To confirm the value of m, two bangles are drawn at random and M=3 is rejected only if both the bangles are red.
1. Write down null hypothesis and alternative hypothesis. Whether these are simple or composite?
2. Specify critical region for the test.
3. Calculate Type I and Type II errors.
4. What is the level of significance?

Q. 5 A Latin Square design was used to compare 5 varieties of Wheat. Table below shows yields in K.G. per plot for varieties A, B, C, D, E. Test for differences in the effect of varieties at 5% and 1% level of significance.

<table>
<thead>
<tr>
<th></th>
<th>D</th>
<th>E</th>
<th>A</th>
<th>C</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.2</td>
<td>5.5</td>
<td>3.7</td>
<td>6.8</td>
<td>7.3</td>
<td></td>
</tr>
<tr>
<td>3.6</td>
<td>4.7</td>
<td>4.7</td>
<td>5.5</td>
<td>6.8</td>
<td></td>
</tr>
<tr>
<td>7.2</td>
<td>5.6</td>
<td>7.2</td>
<td>6.8</td>
<td>7.8</td>
<td></td>
</tr>
<tr>
<td>6.9</td>
<td>5.3</td>
<td>7.0</td>
<td>8.0</td>
<td>7.7</td>
<td></td>
</tr>
<tr>
<td>8.2</td>
<td>8.1</td>
<td>7.6</td>
<td>8.8</td>
<td>7.1</td>
<td></td>
</tr>
</tbody>
</table>
Q. 6  

a) Following data gives the number of blind persons per lakh population in different age groups.

<table>
<thead>
<tr>
<th>Age Yrs</th>
<th>X</th>
<th>0-10</th>
<th>10-20</th>
<th>20-30</th>
<th>30-40</th>
<th>40-50</th>
<th>50-60</th>
<th>60-70</th>
<th>70-80</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blind Y</td>
<td></td>
<td>55</td>
<td>67</td>
<td>100</td>
<td>111</td>
<td>150</td>
<td>200</td>
<td>300</td>
<td>500</td>
</tr>
</tbody>
</table>

1. Find correlation coefficient between X & Y.
2. Find equations of regression lines.
3. Find X when Y is 160 and Find Y when X is 40.

b) Comment on the following :-
   1. There is no relationship between correlation coefficient and regression Coefficients.
   2. Correlation coefficient lies between -1 & +1.
   3. Correlation coefficient is independent of change of origin and scale.

Q. 7  

A Life Assurance Company issues 25,000 Policies in a Year. The Average Annualized Premium per Policy is not known, and to be estimated from Random Sample of 250 Policies. The Standard Deviation of the Distribution of Annualized Premium per policy is reported to be Rupees 2,500/-. A sample result of 250 policies revealed that Average Annualized Premium per Policy is Rupees 25,000/-.  

1. Find Standard Error of Average Annualized Premium per Policy.
2. Estimate Average Annualized Premium per Policy for entire Group of 25,000 Policies on Random Sample basis with 90%, 95%, and 99% Confidence-interval.
3. Find Probability that the difference between Sample Average Annualized Premium Per policy and Population Average Annualized Premium per policy and Population is :-
   a) Minimum Rupees 250/-.  
   b) Maximum Rupees 250/-.  
4. Find the Minimum Sample size in order to be 90%, 95%, and 99% Confident that the difference between Sample Average Annualized Premium per policy and Population Average Annualized Premium per policy will be Less than 2% of Sample Average Annualized Premium per policy, that is, Rupees 500/-.  

Q. 8  

a) The theory predicts that proportion of beans in four groups A, B, C, D should be 9:3:3:1. In an experiment among 1600 beans, the number in four groups were 882,313, 287 and 118. Does the experimental result support the theory?  

b) i) What do you understand by the term ‘Non-Parametric’ methods? Explain with special reference to power efficiency and sample size.
ii) Show how null hypothesis varies when $X^2$ (Chi-square) test is used for testing independence, homogeneity and goodness of fit.

END