B. Tech
(SEM. IV) EXAMINATION. 2006 - 2007
BIO-STATISTICS

Time : 2 Hours] [Total Marks : 50

Note : Attempt all question. In case of numerical problems assume data wherever not provided. Be precise in your answers.

1. Attempt any four parts of the following : \(3 \times 4 = 12\)
   
   (i) Prove that \(a^2 + b^2 = p^2 + q^2\) where a 
   \(\cos \theta + b \sin \theta = p\) and a \(\sin \theta - b \cos \theta = q\).
   
   (ii) The sum of first five terms of a geometric proqures (i, r, \(r^2\), ...) is 31 and the number satisfied the relation \(r^5 - 15r = 2\). Find the number.
   
   (iii) Differentiate the \(r^{10} \cdot \sin 12x \cdot C^{3x}\).
   
   (iv) Integrate \(\frac{dx}{\sqrt{x^2 - a^2}}\).
   
   (v) Evaluate \(\ln (1 + \sin x)^{\text{cat} \cdot x}\).
   
   (vi) Describe the steps in Completely Randomized Design (CRD) and its advantage in brief.
2 Attempt any four parts of the following : \(3.5 \times 4\)

(i) Calculate co-relation coefficient \(r\) for the following data:

<table>
<thead>
<tr>
<th>(x)</th>
<th>65</th>
<th>68</th>
<th>62</th>
<th>70</th>
<th>65</th>
<th>72</th>
<th>67</th>
<th>66</th>
<th>68</th>
<th>70</th>
<th>79</th>
</tr>
</thead>
<tbody>
<tr>
<td>(y)</td>
<td>128</td>
<td>140</td>
<td>120</td>
<td>152</td>
<td>138</td>
<td>160</td>
<td>135</td>
<td>130</td>
<td>125</td>
<td>165</td>
<td>158</td>
</tr>
</tbody>
</table>

(ii) Find out Karl-Pearson's coefficient of correlation for the following data:

<table>
<thead>
<tr>
<th>(x)</th>
<th>100</th>
<th>101</th>
<th>102</th>
<th>102</th>
<th>100</th>
<th>99</th>
<th>97</th>
<th>98</th>
<th>96</th>
<th>95</th>
</tr>
</thead>
<tbody>
<tr>
<td>(y)</td>
<td>98</td>
<td>99</td>
<td>99</td>
<td>97</td>
<td>95</td>
<td>92</td>
<td>95</td>
<td>94</td>
<td>90</td>
<td>91</td>
</tr>
</tbody>
</table>

(iii) Find out two lines of regression from following data:

<table>
<thead>
<tr>
<th>(x)</th>
<th>18</th>
<th>19</th>
<th>20</th>
<th>21</th>
<th>22</th>
<th>23</th>
<th>24</th>
<th>25</th>
<th>26</th>
<th>27</th>
</tr>
</thead>
<tbody>
<tr>
<td>(y)</td>
<td>17</td>
<td>17</td>
<td>18</td>
<td>18</td>
<td>19</td>
<td>19</td>
<td>19</td>
<td>20</td>
<td>21</td>
<td>22</td>
</tr>
</tbody>
</table>

(iv) It is known from the past experiments that in a certain plants there are on an average 4 industrial incidents per year. Find the probability that in a given sample there will be less then 4 accidents. Assume the position distribution.

(v) In a bivariant population the line of regression, are

\[ y = \frac{1}{16} (x + 30) \quad \text{and} \quad x = \frac{1}{8} (y + 30) \]

find the \( \bar{x} \) and \( \bar{y} \) and the coefficient of co-relation \( r \) by means of \( b_{yx} \) and \( b_{xy} \).

(vi) Explain the difference between co-relation and regression and also add a note on their significance.
3 Attempt any two parts of the following: 6×2=12

(i) In a mutation breeding experiment gamma irradiation effect was evaluated on 100 seeds weight in gm per plant of black gram variety in M₂ generation. The experimenter obtained the following results. Analyze the data using t-test and give your inference with respect to gamma irradiation.

100 gm weight per plant

<table>
<thead>
<tr>
<th>Control</th>
<th>2.9</th>
<th>3.1</th>
<th>3.5</th>
<th>3.4</th>
<th>4.0</th>
<th>4.2</th>
<th>3.7</th>
<th>3.0</th>
<th>4.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treated</td>
<td>2.7</td>
<td>2.8</td>
<td>3.0</td>
<td>3.5</td>
<td>3.7</td>
<td>3.0</td>
<td>3.1</td>
<td>3.9</td>
<td>2.9</td>
</tr>
</tbody>
</table>

(ii) Discuss the advantage and limitation of computer package in analyzing the data. Is there any disadvantage?

(iii) Describe the properties of a good estimator. What do you mean by point estimation and interval estimation?

4 Attempt any two parts of the following: 6×2=12

(i) Data on weight in gm of two treatment of NMU (Nitroso-Methyl Urea) are recorded. Find out weather these two treatments have identical effect?

(ii) Describe multiple regression techniques for testing and prediction in biotechnology
(iii) Define the degree of freedom. A certain drug was administrated to 450 persons out of 800 persons in particular locality against typhoid. The results so obtained are given below:
Workout the effectiveness of the drug using chi square test