 LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

**M.Sc.** DEGREE EXAMINATION - **STATISTICS**

FIRST SEMESTER – APRIL 2011

# ST 18167 – STATISTICAL COMPUTING I

Date : 20-04-2011 Dept. No. Max. : 100 Marks

Time :

**Answer all the questions (4 x 25 =100 Marks)**

1 a) The following frequency distribution gives the number of albino children in families of five children

having at least 1 albino child:

|  |  |
| --- | --- |
| No. of Albinos (x) | No. of Families (f) |
| 1 | 22 |
| 2 | 26 |
| 3 | 9 |
| 4 | 2 |
| 5 | 1 |

Fit a **truncated binomial distribution** for the above frequency distribution and test the goodness of

fit at 5% level.

b) Fit a **normal distribution** to the following data by area method and test the goodness of fit

at 5% level of significance:

|  |  |
| --- | --- |
| **x** | **f** |
| 40 – 60 | 8 |
| 60 – 80 | 12 |
| 80 – 100 | 20 |
| 100 – 120 | 25 |
| 120 – 140 | 45 |
| 140 – 160 | 22 |
| 160 – 180 | 16 |
| 180 – 200 | 16 |
| 200 – 220 | 4 |

( 15 +10)

(OR)

c) The table below gives the frequency distribution of the number of dust nuclei in a small volume

of air that fell on to a stage in a chamber containing moister and filtered air:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| No. of dust nuclei (x) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| f | 60 | 84 | 98 | 70 | 37 | 20 | 5 | 3 |

It is suspected that a number of zero counts were wrongly rejected on the ground that the apparatus was not working and hence not recorded. Fit a **truncated Poisson distribution** to the above frequency distribution and test the goodness of fit.

d) For the following frequency distribution, fit a **negative binomial distribution** and test the

goodness of fit at 5% level:

(13+12)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| x | 0 | 1 | 2 | 3 | 4 | 5 |
| f | 212 | 128 | 40 | 15 | 3 | 2 |

2 a) Generate a sample of size 5 from the **Bivariate normal distribution** given below:



( 25 )

(OR)

b) Given the three selected points U1,U2 and U3 corresponding to t1 = 2 , t2 = 30and

t3 = 58 as follows:

t1 = 2, U1 = 55.8

t2 = 30, U2 = 138.6

t3 = 58, U3 = 251.8

Fit a **logistic curve** by the method of selected points. Also obtain the **trend values**

for t = 5, 18, 25, 35, 46, 50, 54, 60, 66, 70.

3. a)Find the **inverse** of the following matrix **A** using **partitioning method:**

A = 

(Or)

b) (i) Obtain the **Rank, Index and Signature** of the following matrix **A**:

**A** = 

(ii) Verify whether or not the following matrix is **negative definite**:

**B** =  (15 + 10)

4) a) Determine **Tolerance and Variance Inflation Factor(VIF)** for each explanatory variable based

on the data and fitted auxiliary regression equations given below:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Y | 8 | 9 | 7 | 5 | 6 | 4 | 5 | 2 | 1 | 3 |
| X1 | 5.2 | 5.6 | 4.8 | 4 | 6 | 5 | 4.5 | 2.3 | 1.5 | 2.6 |
| X2 | 5.1 | 5.2 | 4.7 | 3.2 | 3.2 | 5.4 | 3.9 | 2.6 | 1.8 | 2.1 |
| X3 | 2.3 | 1.2 | 1.5 | 1.6 | 1.4 | 1.8 | 1.9 | 1.8 | 1.5 | 1.6 |

Fitted Auxiliary regression equations are

X1 = 2.211 + 0.95X2 -0.961X3

( 25 )

X2 = -0.805 + 0.704X1 + 0.966X3

X3 = 1.568 – 0.102 X1 + 0.139X2

(OR)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Y | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| X1 | 2.45 | 1.2 | 2.5 | 2.14 | 1.6 | 2.19 | 2.1 | 2.8 | 1.5 | 2.8 | 2.18 | 1.1 | 2.22 | 2.23 | 1.5 | 2.11 | 2 | 1.9 | 1.4 | 2.7 |
| X2 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 |
| X3 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 |

b) Consider the following data and the fitted Logistic regression model



Determine the following:

1. **Optimal Cut point** based on Gains table
2. **Classification table** based on the optimal cut point , **Sensitivity and Specificity.**

(18+7)

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