**SUBJECT CODE : 11CM/AC/SB44**

**B.Com./B.Com(CS)  DEGREE EXAMINATION APRIL 2015**
**FOURTH SEMESTER**

COURSE    :    **ALLIED – CORE**
PAPER     :    **BUSINESS STATISTICS**
TIME      :    **3 HOURS**                              **MAX. MARKS :100**

**SECTION – A**
**ANSWER ALL THE QUESTIONS**                              **(10 × 3 = 30)**

1. What are the various component of time series and explain briefly one of them.

2. *Draw a figure to fit a trend line by the method of semi-averages.*

| Year | 1996 | 1997 | !998 | !999 | 2000 | 2001 | 2002 |
|------|------|------|------|------|------|------|------|
| Sales ('000units) | 110 | 105 | 115 | 112 | 120 | 118 | 130 |

3. Calculate partial correlation  coefficients

   $r_{12.3}$ $and$ $r_{23.1}$ using $r_{12} = 0.86$, $r_{13} = 0.65$, $r_{23} = 0.72$

4. Define the coefficient of multiple correlation for three variables.

5. Define type I and type II error.

6. The sales manager of a large company conducted a sample survey in states A and B taking 400 samples in each case. The results were

| States | Average sales | Std. deviation sales |
|--------|---------------|----------------------|
| A | Rs2500 | Rs 400 |
| B | Rs2200 | Rs 550 |

   Test at a significance level of 1% for the average sale.

7. Define a Chi-square statistic and state where it is applied.

8. State and prove additive property of Chi-square variate.

9. What are the assumptions of Analysis of variance?

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10. The information in regard to two makes A and B are given below:

|  | A | B |
|---|---|---|
| Sample size | 21 | 16 |
| Mean run life | 100 | 95 |
| Standard deviation | 2.5 | 1.5 |

The firm wants to know if the variance of two are significantly different by applying F-test at 5% level of significance.

## SECTION – B

**ANSWER ANY FIVE QUESTIONS** $(5 \times 8 = 40)$

11. Fit a trend line to the following series. Estimate the value of 2008

| Year | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|
| Production of steel(in tonnes) | 60 | 72 | 75 | 65 | 80 | 85 | 95 |

12. Use the method of monthly averages to determine the seasonal indices for the following data of production of a commodity bases on years 1986,1987,1988:

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sept | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1986 | 12 | 11 | 10 | 14 | 15 | 15 | 16 | 13 | 11 | 10 | 12 | 15 |
| 1987 | 15 | 14 | 13 | 16 | 16 | 15 | 17 | 12 | 13 | 12 | 13 | 14 |
| 1988 | 16 | 15 | 14 | 16 | 15 | 17 | 16 | 13 | 10 | 10 | 11 | 15 |

13. On the basis of observations made on 35 copies plants the total correlations of yield of cotton $X_1$, numbers of balls (ie) seed vessels($X_2$) and height ($X_3$) are found to be $r_{12} = 0.863$, $r_{13} = 0.648$, $r_{23} = 0.709$. Determine the multiple correlation $R_{1.23}$ and the partial correlation $r_{12.3}$ $and$ $r_{13.2}$. and interpret your results.

14. Given the following , determine the regression equation of
    (i) $x_1$ on $x_2$ and $x_3$.
    (ii) $x_2$ on $x_1$ and $x_3$. $r_{12} = .8$, $r_{13} = 0.6$, $r_{23} = 0.5$, $\sigma_1 = 10$, $\sigma_2 = 8$, $\sigma_3 = 5$.

15. A company is testing two machines A random sample of 8 employees is selected and each employee uses each machine for one hour. The number of components produced is shown below. Test whether there is evidence of difference between the machines in the mean number of components produced at 5% level of significance.

| Employee | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| MachineI | 96 | 107 | 84 | 99 | 102 | 87 | 95 | 101 |
| MachineII | 99 | 112 | 90 | 97 | 108 | 97 | 94 | 98 |

16. Out of 8000 graduates in a town , 800 are females and out of 1600 graduate employees 120 are females. Use Chi-square to determine if any distinction is made in appointment on the basis of sex.

Observed Frequencies

|  | Male | Female | Total |
|---|---|---|---|
| Employed | 1480 | 120 | 1600 |
| Unemployed | 5720 | 680 | 6400 |
| Total | 7200 | 800 | 8000 |

17. Three samples below have been obtained from normal populations with equal variances. Test the hypothesis at 5% level that the population means are equal.

| A | B | C |
|---|---|---|
| 8 | 7 | 12 |
| 10 | 5 | 9 |
| 7 | 10 | 13 |
| 14 | 9 | 12 |
| 11 | 9 | 14 |

## SECTION –C

**ANSWER ANY TWO QUESTIONS** $(2 \times 15 = 30)$

18. Fit a straight line trend by the method of least squares to the following data. Assuming the same rate of change continues what would be predicted sales for the tear 2009?

| Year | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|
| Sales(Rs Lakhs) | 76 | 80 | 130 | 144 | 138 | 120 | 174 | 190 |

Calculate the trend values from 2000 to 2007.

19. Find the multiple linear regression of $X_1$ on $X_2$ and $X_3$ from the data relating to three variables are given below:

| $X_1$ | 11 | 17 | 26 | 28 | 31 | 35 | 41 | 49 | 63 | 69 |
|---|---|---|---|---|---|---|---|---|---|---|
| $X_2$ | 2 | 4 | 6 | 5 | 8 | 7 | 10 | 11 | 13 | 14 |
| $X_3$ | 2 | 3 | 4 | 5 | 6 | 7 | 9 | 10 | 11 | 13 |

20 a) Below are given the gains in weights(lbs) of cows fed on two diets X and Y. Gain in weights(in lbs)

| Diet X | 25 | 32 | 30 | 32 | 24 | 14 | 32 |  |  |  |
|---|---|---|---|---|---|---|---|---|---|---|
| Diet Y | 24 | 34 | 22 | 30 | 42 | 31 | 40 | 30 | 32 | 35 |

Test 5% level , whether the two diets differ as regards their effect on mean increase in weight.

b) The following table gives the data on the hardness of wood stored outside and inside the room .

|  | outside | inside |
|---|---|---|
| Sample size | 40 | 110 |
| Mean | 117 | 132 |
| Sum of squares of deviation from mean | 8655 | 27244 |

Test whether the hardness is effected by weathering.

21. A credit rating agency conducted a survey of customers and analyses them by occupation and credit risk. The result were as follows.

| Credit rating | Adminstrative& clerical | Skilled manual | Semi-skilled & Unskilled | Total |
|---|---|---|---|---|
| High | 60 | 50 | 10 | 120 |
| Average | 30 | 20 | 10 | 60 |
| Poor | 10 | 10 | 40 | 60 |
| Total | 100 | 80 | 60 | 240 |

Test whether there is any association between occupation and credit rating.

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