# CARMEL COLLEGE OF ARTS, SCIENCE & COMMERCE FOR WOMEN, NUVEM-GOA
## SEMESTER END EXAMINATION, APRIL-MAY 2023

**Sem. IV of BCOM** **Class & Div: SYBCOM (A&B)**
**Course Title: BUSINESS STATISTICS II (GE-05)** **Course Code: UCAG 102**
**Maximum marks: 80** **Date: 29/04/2022** **Duration: 2 hours** **Total No of pages: 4**

*Instructions: 1. All questions are compulsory.*
*2. Figures to the right indicate maximum marks to the questions.*
*3. Use of non-programmable calculator is allowed.*

Q.1. Answer any FOUR of the following: **(4×4 = 16 marks)**

a. Explain the scatter diagram method of measuring correlation. Distinguish between positive and negative correlation with the help of a scatter diagram.

b. Compute the coefficient of rank correlation between marks in two subjects for the following data.

| Marks in Physics | 30 | 80 | 70 | 60 | 50 | 90 |
|---|---|---|---|---|---|---|
| Marks in Chemistry | 70 | 61 | 87 | 45 | 40 | 57 |

c. Compute the coefficient of correlation from the following data:
$n = 9 \quad \sum X = 45 \quad \sum X^2 = 285 \quad \sum Y = 108 \quad \sum Y^2 = 1356 \quad \sum XY = 597.$

d. Given the two regression lines as $5x - 2y = 7$ and $3x - y = 5$. Find the mean of $x$ and mean of $y$.

e. State Lagrange's interpolation formula. When do we use the Lagrange's interpolation formula?

f. From the table, find the missing value using the Binomial expansion method.

| Year | 1999 | 2000 | 2001 | 2002 | 2003 |
|---|---|---|---|---|---|
| Business done in million Rs. | 7 | - | 13 | 21 | 37 |

Q.2. Answer any FOUR of the following: **(4×4 = 16 marks)**

a. Two dice are rolled. Write the sample space and find the probability that the sum of the numbers on the uppermost face is greater than 4.

b. Obtain the probability distribution of 'number of sixes' in two tosses of a die. Hence obtain the expected value of the random variable.

c. Find the probability that in a random arrangement of the letters of the word 'UNIVERSITY', the two I's come together.

d. A sample of 900 members has mean 3.5 cm and standard deviation 0.5 cm. Obtain 95% and 99% confidence limits for the population mean.

e. Explain what is Null Hypothesis, Alternate Hypothesis, Type I and Type II errors with reference to testing of hypothesis.

f. Describe Stratified random sampling and give its relative merits and demerits.

Q.3. Answer either **A and B** or **X and Y**: **(6×2 = 12 marks)**

A. Calculate Karl Pearson's coefficient of correlation from the following data.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Demand ('000 units) : | 12 | 9 | 8 | 10 | 11 | 13 | 7 |
| Supply ('000 units) : | 14 | 8 | 6 | 9 | 11 | 12 | 3 |

B. Given the two regression equations as:
$4X - 5Y + 33 = 0$ and $20X - 9Y - 107 = 0$; variance of $X$ is 9.
Find (a) Correlation coefficient between $X$ and $Y$
(b) Standard deviation of $Y$

**OR**

X. Use Spearman's formula to find coefficient of rank correlation between Wages and cost of living for the data given below.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Wages (Rs.) | 100 | 101 | 103 | 102 | 100 | 99 | 97 |
| Cost of living index | 98 | 99 | 99 | 97 | 95 | 92 | 95 |

Y. The equations of two lines of regression obtained in a correlation analysis are $2x + 3y - 8 = 0$ and $x + 2y - 5 = 0$. Obtain the value of the correlation coefficient and the variance of y, given the variance of x is 12.

Q.4. Answer either **A and B** or **X and Y**: **(6×2 = 12 marks)**

A. Using Newton's backward interpolation, estimate the number of students for 1993 from the given data.

| | | | | |
|---|---|---|---|---|
| Year | 1988 | 1990 | 1992 | 1994 |
| Number of students | 50 | 79 | 102 | 113 |

B. The following table gives the normal weight of the baby with respect to age, Use Lagrange's interpolation method to estimate the weight of the baby at the age of 4 months.

| | | | | |
|---|---|---|---|---|
| Age (in months) | 0 | 2 | 3 | 5 |
| Weight (in lbs) | 5 | 7 | 8 | 10 |

**OR**

X. Construct Newton's forward interpolation for the following data. Use it to find value of $y$ for $x = 5$.

| $x$ | 4 | 6 | 8 | 10 |
|---|---|---|---|---|
| $y = f(x)$ | 1 | 3 | 8 | 16 |

Y. Using Newton-Gregory formula, estimate the expectation of life at the age of 70 years by using the following data.

| Age (in years) | 35 | 45 | 55 | 65 | 75 |
|---|---|---|---|---|---|
| Expectation of life | 34 | 26 | 18 | 12 | 10 |

Q.5. Answer either **A and B** or **X and Y**: **(6×2 = 12 marks)**

A. If 4% of the electric bulbs manufactured by a company are defective, use Poisson distribution to find the probability that in a sample of 100 bulbs.

a) None is defective.

b) Less than 2 bulbs are defective

c) Exactly 4 bulbs are defective

(Given $e^{-2} = 0.13531,\ e^{-4} = 0.0183, e^{-5} = 0.007$)

B. A random variable $X$ has the following probability distribution. Find the value of $k$ and hence use it to find the expected value of $X$.

| Value of $X$ | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Probability | 0.1 | $k$ | 0.2 | $2k$ | 0.3 | $k$ |

**OR**

X. The probability that a student is a swimmer is $1/5$. Out of 5 students considered, find the probability that

(a) 4 are swimmers,

(b) at least 4 are swimmers.

Y. The mean yield for one-acre plot is 668 kilos with standard deviation 32 kilos. Assuming normal distribution, Find how many one-acre plots would you expect to have yield.

a) More than 700 kilos.

b) Between 636 and 700 kilos.

(Given that for a standard normal variate the area between $z = 0$ and $z = 1$ is 0.3413 and 80% of the area lie between $z = \pm 1.25$).

Q.6. Answer either **A and B** or **X and Y**: **(6×2 = 12 marks)**

A. A sample of 100 children have a mean weight of 50.6 kgs. Can it be regarded as a random sample from a large population with mean weight of 50 kgs and standard deviation of 5 kgs at 5% level of significance?

B. Let A and B be two events such that $P(A) = 0.8$, $P(B) = 0.6$, $P(A \cap B) = 0.5$,
Obtain the probabilities (a) $P(A \cup B)$ (b) $P(A/B)$ (c) $P(B/A)$.

**OR**

X. The probability that a contractor will get a plumbing contract is $2/3$, and the probability that he will get an electric contract is $5/9$. If the probability of getting at least one contract is $4/5$, what is the probability that he will get both the contracts.

Y. Write a note on sampling and its uses.

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