Shree Damodar College of Commerce & Economics, Margao, Goa
SYBCOM, Semester IV, Semester End Examination – April 2017

STATISTICAL TECHNIQUES

Duration: 2hours **Max.Marks : 80**

Instructions: 1) All question are compulsory (choice is internal)
2) Start each new question on a fresh page
3) Figures to the right indicate full marks
4) Programmable Calculators not allowed
5) Log tables and graph papers will be supplied on request.

Q.1 Attempt the following:

a) State the meaning of correlation. **(3)**

b) Suppose A *and* B are two equally strong table tennis players. Which of the following two events is more probable: **(6)**

1. A beats B exactly in 3 games out of 4 or
2. A beats B exactly in 5 games out of 8.

c) An urn contains 8 white and 3 red ball. If two balls are drawn at random. Find the probability that

(1) both are white
(2) both are red
(3) one is of each colour **(7)**

OR

Q.I Attempt the following:

x) What is regression? **(3)**

y) A factory producing machine part turns out on an average 3 defective units in every lot of 1000 units. The units are packed, 500 in package. What is the probability that 1) No defective 2) Atmost 2 defective units may be found in a package taken at random($e^{-1.5} = 0.2231$) . **(6)**

z) The odds in favour of A solving a problem are 2: 3 and odds against B solving the problem are 3: 5 .If both A and B attempt the problem independently, find the chance that the problem is solved. **(7)**

Q.2 Attempt the following:

a) State and prove the multiplication theorem. **(3)**

b) For the following data calculate Karl Pearson coefficient of correlation . **(6)**

x	2	4	5	6	8	11
y	18	12	10	8	7	5

c) A machine is set to deliver packets of a given weight.10 samples of size 5 each were recorded.Below are given relevant data : **(7)**

Sample	S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8	S_9	S_{10}
Mean	15	17	15	18	17	14	18	15	17	16
Range	7	7	4	9	8	7	12	4	11	5

Calculate the values for the control limits of mean chart and state whether the process is in control or not. (Given for *the sample of size* 5 , $A_2 = 0.58, D_3 = 0, D_4 = 2.115$)

OR

Q.II Attempt the following:

x) Define 1) Probability of an event 2) Independent events. **(3)**

y) You are given the following information **(6)**

	x	y
Mean	36	85
Standard deviation	11	8

Correlation coefficient = 0.66

1. Obtain the two regression lines.
2. Find the likely value of x when $y = 75$.

z) The following are the sample range of 10 samples each of size 5. Calculate the control limits for the range chart and state whether the process is in control or not. **(7)**

(*Given* $D_3 = 0, D_4 = 2.115$ *for the sample of size* 5)

Sample:	1	2	3	4	5	6	7	8	9	10
Range:	5	6	5	7	7	4	8	6	4	6

Q.3 Attempt the following:

a) Write a short note on Stratified sampling. **(3)**

b) Find the Karl Pearson coefficient of correlation of the following data: **(6)**

$$\sum x = 125, \sum y = 100, \sum xy = 520, \sum x^2 = 650, \sum y^2 = 436, n = 25$$

c) If a random sample of size 20 from a normal population with standard deviation 5.2 shows a mean of 16.9, test at 5% significance level that the population mean is 15.5. Also calculate 99% confidence limit for mean. **(7)**

OR

Q.III Attempt the following:

x) Explain briefly Quota and Cluster sampling **(3)**

y) For a bivariate data the mean of X is 20 and the mean of Y is 45. The regression coefficient of Y on X is 4 and that of X on Y is 1/9. Find **(6)**

1. The coefficient of correlation
2. The Standard deviation of X if the Standard deviation of Y is 2.
3. Also write down the equations of regression lines.

z) ***i***)A bottle manufacturing process is under control if "no more than 1% of the bottles are defective". A random ample of 120 bottles showed 5 to be defective. Do these data indicate that the process is out of control? Test the hypothesis at 5% level of significance. (4)

ii) In a sample survey of 1000 house-wives in a city 23% prefer a particular brand of pressure cooker. Find 99% confidence limits for the percentage of all housewives in the city preferring that brand of cooker. (3)

Q.4 Attempt the following:

a) Define the probability function of Poisson distribution. State its properties **(3)**

b) For a particular product the sales(y) and advertisement (x) for 10 years, provide the results. **(6)**

$$\sum x = 15, \sum y = 110, \sum xy = 400, \sum x^2 = 250, \sum y^2 = 3200, n = 6$$

Find the regression line of y on x and the estimated value *of* y *for* $x = 10$

c) The no. of defects in the six samples of a certain product is given below. Find the control limits and draw the control chart for C. Also state whether the system is in control. **(7)**

Samples:	S_1	S_2	S_3	S_4	S_5	S_6
Faults:	4	3	9	2	2	3

OR

Q.IV Attempt the following:

x) State the properties of Normal distribution. **(3)**

y) The following table shows the ranks of 10 students according to their achievements in practical's and theory papers of a Statistics course. Find the coefficient of rank correlation. **(6)**

Practical's:	8	3	9	2	7	10	4	6	1	5
Theory :	9	5	10	1	8	7	3	4	2	6

z) The following data refers to the no. of defectives in 10 samples of 100 items each. Construct

Samples No.:	1	2	3	4	5	6	7	8	9	10
No.of defectives:	3	8	11	3	10	7	6	16	12	5

Q.5 Attempt the following:

a) Explain the terms 1) critical region and 2) level of significance. **(3)**

b) Assuming that it is true that 2 in 10 industrial accidents are due to fatigue , find the probability that

i) Exactly 2 of 8 industrial accidents will be due to fatigue.

ii) Atleast 2 of 8 industrial accidents will be due to fatigue **(6)**

c) *i*)A card is drawn from a well shuffled pack of playing cards. Find the probability that it is either a diamond or a king. **(4)**

ii)$\bar{x} = 23, \bar{y} = 35, \sigma_x = 2, \sigma_y = 3, \gamma_{xy} = 0.6$, Estimate y when $x = 20$ and x when $y = 38$ **(3)**

OR

Q.V Attempt the following:

x) Distinguish between point estimation and interval estimation. Explain how an interval estimation better than a point estimate. **(3)**

y) The hourly wages of 1000 workmen are normally distributed around a mean of Rs. 70 and with a standard deviation of Rs.5. Estimate the number of workers whose hourly wages will be :

i) Between Rs.69 and Rs.71

ii) More than Rs.75

(Area under the standard normal curve for $t = 0$ *to* $t = 0.2$ *is* 0.0793 *and* $t = 0$ *to* $t = 1$ *is* 0.3413). **(6)**

z) *i*) Two cards are drawn from a pack of 52 cards. X denotes the no. of heart card drawn. Find the probability distribution and expectation. **(4)**

ii) The marks of 8 candidates in Economics and Accountants are given below, find the Spearman's rank correlation. **(3)**

Economics	76	90	98	69	54	82	67	52
Accountants:	25	37	56	12	7	36	23	11