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S.Y.BCOM,Semester IV,Semester End Examination-April 2016

STATISTICAL TECHNIQUES

Duration:2hrs Max. Marks:80

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Graph paper will be provided on request.
4. Use of calculators is allowed.

Q1 a. Explain the meaning of Correlation. 3

b A police authority conducts an eight week experiment. In each week it records the number of foot patrols "x" made in a small town and the number of reported crimes "y", in that town. The data are summarized as follows: 6

$$\sum x = 25, \sum x^2 = 85, \sum xy = 93, \sum y = 47, \sum y^2 = 251, n = 10$$

Calculate the value of the Karl Pearson's Coefficient of Correlation for these data.

c The heights (in centimeters) and weight (in kilograms) of 10 basketball players on a team are:

Player	A	B	C	D	E
Ht(x)	192	193	193	203	205
Wt(y)	90	87	91	100	101

Calculate:

1. The regression line of y on x. 6
2. The estimated weight of a player who measures 208 cm. 1

OR

QI x Define regression. Why are there two regression lines in general? 3

y If the two regression lines for a bivariate data are 2x=y+15 and 4y=3x+25,find: 6

1. Mean of x and y
2. Regression coefficient i.e. b_{xy} and b_{yx}
3. Coefficient of correlation.

z Following are the marks obtained by 7 students in two subjects, Statistics and Mathematics. Calculate Spearson's rank coefficient of correlation .To what extent is the knowledge of both subjects related? 7

Statistics	68	95	52	65	70	69	59	66
Mathematics	84	91	67	72	74	73	71	79

Q2a Explain the terms: 3

1. Hypothesis
2. Null Hypothesis
3. Alternative Hypothesis.

b Find the coefficient of correlation for the following data: 6

x	2	5	8	10	6	3	1
y	4	6	7	8	5	4	3

c Consider a computer system with Poisson job-arrival stream at an average of 2 per minute. Determine the probability that in any one-minute interval there will be (i) 0 (ii) exactly 2 (iii) at most 3 ; job-arrivals.(given $e^{-2}=0.135$) 7

OR

y The table shows a Verbal Reasoning test score **x**, and an English test score **y**, for each of a random sample of 8 children who took both tests.

Child	A	B	C	D	E	F	G	H
x	112	113	110	113	112	114	109	113
y	69	65	75	70	70	75	68	76

1. Calculate the rank correlation coefficient between the scores in Verbal reasoning and English. 5
2. Comment briefly, in context, on the result obtained in part (1). 1

z (i)Write the properties of normal distribution. 3

(ii)If X follows normal distribution with mean 66 and standard deviation 5 find: 4

1. $P(65< x <70)$
2. $P(x \geq 72)$

[Given $P(0 < z < 0.80)=0.2881$, $P(0< z < 0.2)=0.0793$ and $P(0 <z < 1.2)=0.3849$;where z is standard normal variate]

Q3a State the extreme values of the coefficient of correlation 'r' and interpret them. 3

b The distance in kilometers, travelled to work by the employees of a city council may be modeled by a normal distribution with mean 7.5 and standard deviation 2.5.Find the probability that the distance travelled to work by a randomly selected employee of the city council is 6

i) Less than 11 km ii) Between 5.5 km and 10.5 km.

(area between z=0 and z=0.8 is 0.2881 , between z=0 and z=1.2 is 0.3849 , between z=0 and z=1.4 is 0.4192 ,where z is standard normal variate)

c (i) A local chamber of commerce claims that the mean family income in a city is Rs. 12,250.An Economist suspects otherwise and runs a hypothesis test using a sample of 135 families and finds a mean of Rs 11,500 with standard deviation of Rs. 3180.Should the Rs. 12250 claim be rejected at 5% level? 4

(ii) Also find 99% confidence interval for mean family income. 3

OR

QIIIx Distinguish between Positive and Negative Correlation. 3

y On any given day, the probability that the entire Gupta family eats dinner together is 2/5. Find the probability that, during any 7-day period, the Gupta's eat dinner together at least six times 6

z i)A random sample of size 400 has sample proportion0.75.Can we say that ,it is drawn from a population with proportion P=0.8 at 1% level of significance. 4

ii) State the properties of a Good estimator 3

Q4a. Compare the advantages and disadvantages of the census and sample method. 3

b A Player throws a fair die. If a prime number occurs he wins the number of rupees, but if a non-prime number occurs he loses hat number of rupees. Find whether the game is favorable to the player. 6

c Daily samples of 100 power drills are removed from Drill Master's assembly line and inspected for defects. Over the past 20 days, the following information has been gathered. Develop a p-chart. Is the process in control? 7

Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
No. of																				

QIVx What is systematic random sampling? 3

y Two urns, one contains 5 white and 3 black balls and the other contains 4 white and 5 black balls. Two balls are drawn at random from any one of them. What is the probability that two selected balls are white. 6

z A well known company manufacturing Laptops select 5 laptops at random for testing their qualities. The number of defects found in each Laptop is as follows 7

Sample Laptops	L_1	L_2	L_3	L_4	L_5
No. of defects	**2**	**3**	**5**	**0**	**1**

Draw the control chart of c. Also state whether the quality if the production of the company is in control.

Q5 a Explain briefly the causes of variation in the Quality of products. 3

b i)What are advantages of statistical quality control? 3

ii) Obtain control limits for the range chart for 10 samples of size 5 for the data given below. Can the process is said to be under control with respect to range? 3

Sample No.	1	2	3	4	5	6	7	8	9	10
Range	2.1	3.1	3.9	2.1	1.9	3.0	2.5	2.8	2.5	2.1

(for n=5,D_3=0 and D_4=2.115)

c A random variable X has the following probability distribution 7

X=x	0	1	2	3	4	5	6	7
P(x)	0	2k	3k	k	2k	k^2	$7k^2$	$2k^2+k$

Find the value of k and evaluate P(X<6), P(X≥6), P(2<X<3)

OR

QVx What is the main purpose of a control chart? 3

y Five samples of size 5, are drawn. Their respective mean and range are given below 6

Samples	S_1	S_2	S_3	S_4	S_5
Mean	4.8	4.6	4.2	4.3	4.4
Range	2	0.55	0.51	0.52	0.56

Draw control charts of $\bar{X}$ using the range R. State whether the system is in control with respect to these parameters. (For sample size 5,A_2=0.577).

z i) In a certain college, the students engage in various sports in the following proportions: 5
Football (F):60% of all students; Basketball (B):50% of all students; Both football and basketball: 30% of all students.
If a student is selected at random, what is the probability that he will:
1. Play football or basketball? 2. Play neither sport?

ii) Define Mutually exclusive events and Independent events. 2