ALLAMA IQBAL OPEN UNIVERSITY, ISLAMABAD
(Department of Mathematics and Statistics)

Course: Intermediate Statistics-II (395)   **Semester: Autumn, 2012**
Level: FA   **Total Marks: 100**

ASSIGNMENT No. 1
(Units 1-5)

Note: All questions are compulsory and carry equal marks.

Q.1   a)   Find the variance of the binomial distribution.

      b)   Define the normal probability density functional and the normal commutative distribution function. Find the equation of normal curve with mean μ and standard deviation σ. Also find the ordinates of the standard normal curve at $z = -0.86$.

Q.2   a)   The heights of boys at a particular age, follow a normal distribution with mean 150.3 cm and standard deviation 5.0 cm. Find the probability that a boy picked at random from this age groups has height.
        i)   Less than 153 cm
        ii)   More than 140 cm
        iii)   Between 145 cm and 156 cm

      b)   What is importance of normal distribution in statistical theory? Suppose that X is normally distributed with $\mu = 25$ and $\sigma = 5$. Find the lower and upper quartiles?

Q.3   a)   Distinguish between the following terms:
        i) Population and sample   ii) Sampling with and without replacement
        iii) Precision and accuracy   iv) Sampling and non-sampling errors

      b)   A large number of samples of size 50 were selected at random from a normal population with mean μ and variance σ^2. The mean and standard error of the sampling distribution of the sample mean were obtained 2500 and 4 respectively. Find the mean and variance of the population.

Q.4 a) The percentage of families with a monthly income of Rs. 1000 or more in city A and B are 25% and 30% respectively, if a random sample of 100 families is selected from each of these two cities and the proportion of families earning Rs. 1000 or more in two samples are compared, what is the mean and standard error of $P_1 - P_2$, the difference between the sample proportions?

b) Explain and discuss the terms: statistical inference, estimation, estimator and estimate.

Q.5 a) A finite population consists of number 4, 5, 6 and 8. Find the proportion of even number is all possible random samples of size i.e. n = 3, when sampling is done without replacement. By forming the sampling distribution of sample proportions, show that sample proportion is an unbiased estimator of the population proportion. Also verify the relation

$$\text{Var (P)} = \frac{\pi\,(1-\pi)}{n}\left(\frac{N-n}{N-1}\right)$$

Where P and π are sample and population proportions respectively.

b) A manufacturer of house-dresses sent out advertising by mail. He sent samples of material to each of two group of 1000 women. For one group, he enclosed a white return envelope and for other groups, a blue envelope. He received orders from 9% and 12% respectively. Is it quite certain that the blue envelope will help sales? Use 5% level of significance.

ASSIGNMENT No. 2
(Units 6-9)

Note: All questions are compulsory and carry equal marks.

Q.1 a) A random sample of 7 pairs of observations (x_i, y_i) is given below:

xi	3	2	5	1	4	6	8
yi	13	9	27	8	8	7	14

Fit a least squares linear regression line of Y on X. Also estimate the value of y when x = 6.

b) Differentiate between regression and correlation problem? For a set of 50 pairs of observations on variables X and Y, we have
$$\sum(x_i - \bar{x})(y_i - \bar{y}) = 450$$
Find the covariance?

Q.2 a) Define correlation and product moment co-efficient of correlation? Also for a given set of data, we have $S_x{}^2 = 9.102, Sy{}^2 = 2.204, S_{xy} = 1.694$. Calculate and interpret the product moment correlation coefficient for the data?

b) Define positive, negative and ultimate classes. Find frequencies of the positive and negative classes and the whole number of observations from the following information.
(AB) = 95, (A β) = 55, (∝ β) = 45 and (∝ β) = 85.

Q.3 a) A thousand households are taken at random and divided into three groups i.e. A, B and C according to the total weekly income. The following table shows the numbers in each group having a colour television receiver, a black and white receiver, or no TV at all.

TV Type	Income Groups		
	A	B	C
Colour TV	56	51	93
Black & White	118	207	375
No TV	26	42	32

Test the association between the two attributes i.e. income groups and TV type.

b) Define rank correlation and calculate its coefficient. For a given set of five sacks of coal A, B, C, D and E having different weights, with A being

heavies than B, B being heavier than C, and so on, A weight lifter ranks the sacks (heaviest first) is the order A, D, B, E, C.

Q.4 a) What is time series? What are different movements that may be present in a time series? Plot the original time series to obtain a histogram.

Year	1928	1983	1984	1985	1986	1987	1988	1989	1990
Value	50.0	36.5	43.5	36.8	32.6	41.7	41.1	42.3	32

b) Ten young recruits were put through a physical training programme by the army. Their weights were recorded before and after the training with the following results:

Recruit	1	2	3	4	5	6	7	8	9	10
Weight (Before)	127	126	162	170	143	205	168	175	197	136
Weight (After	135	200	160	182	147	200	172	186	193	141

Using $\alpha = 0.05$, should we conclude that the training programmes affects the average weight of young recruits.

Q.5 a) The mean and variance of the monthly income in PKR of the workers employed in two factories from the samples are given below:

Sample	Size	Mean	Variance
Factory A	160	12.80	64
Factory B	220	11.25	49

i) What is the maximum likelihood estimate of the difference in mean incomes?
ii) Compute 95% confidence interval estimate for the real differences in income of the workers from the two factories?

b) How are the classified computers? What are the major categories of computers and what is CPU and why CPU is called brain of computer?