UNIVERSITY OF THE PUNJAB

B.A. / B.Sc. Part – I
Annual Examination - 2018

Roll No. .....

Subject: Statistics-I | **TIME ALLOWED: 3 hrs.**
PAPER: A (Statistics-I) | **MAX. MARKS: 75**

NOTE: Attempt any FIVE questions selecting at least TWO questions from each section. Use of Scientific Calculators and Statistical tables is allowed.

SECTION-I

Q.1 a) What are the uses of Statistical information? **(06)**

b) Differentiate between graph, diagram and chart. **(04)**

c) A man gets a rise of 10% in salary at the end of his first year of service, and further rises of 20% and 25% at the end of the second and third years respectively, the rise in each case being calculated on his salary at the beginning of the year. To what annual percentage increase is this equivalent? **(05)**

Q.2 a) Define Mean Deviation and its co-efficient. Discuss its advantages and uses. **(3+4)**

b) A manufacturer of television tubes has two types of tubes A and B. The tubes have respective mean life-times $\bar{x}_A = 1495$ hours and $\bar{x}_B = 1895$ hours: and standard deviations $S_A = 280$ hours and $S_B = 310$ hours. Which tube has the greater (i) absolute dispersion, (ii) relative dispersion? **(06)**

c) Why we use coefficient of variation? **(02)**

Q.3 a) Compare Fixed base index and Chain base index numbers. **(04)**

b) Prove that Fisher's Ideal index satisfies both the time reversal and the factor reversal test but does not conform to the circular test. **(04)**

c) The prices and quantities of three commodities during 1997 and 2007 are given below: **(07)**

Commodity	Price		Quantity	
	1997	2007	1997	2007
A	12	10	501	600
B	38	50	100	194
C	40	40	56	76

Compute weighted-aggregative price index for 1997 with 2007 = 100 by Paasche's method.

Q.4 a) Describe the different components of time series. Discuss the measurement techniques of secular trend. **(4+4)**

b) The estimated number of visitors ('00s) at a holiday resort were as follows: **(07)**

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Visitors	31	49	74	62	65	73	70	84	86	79

Show by direct numerical calculation that the 2-year centred moving average is equivalent to a 3 year weighted moving average with weights 1, 2, 1 respectively.

Q.5 a) Explain what is meant by (i) *regression,* (ii) *regressand,* (iii) *regressor,* and (iv) regression co-efficient. **(04)**

b) Given these ten pairs of (X, Y) values: **(5+3+3)**

X	1	1	2	3	4	4	5	6	6	7
Y	2.1	2.5	3.1	3.0	3.8	3.2	4.3	3.9	4.4	4.8

i) Carry out the necessary computations to obtain the least-squares estimates of the parameters in the simple linear regression $Y_i = \alpha + \beta X_i + e_i$.

ii) Use the regression equation to predict the values of Y for different values of X as given in the question.

iii) Using predicted values in ii) above find standard error of estimate.

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SECTION-II

Q.6 a) Elaborate the statement that "two mutually exclusive events need not be equally likely" by giving suitable examples. **(04)**

b) Compare the probability of a total of 9 with that of a total of 10 when three fair dice are tossed once. **(06)**

c) A set of eight cards contains one joker. A and B are two players and A chooses 5 cards at random, B taking the remaining 3 cards. What is the probability that A has the joker? **(05)**

Q.7 a) A committee of three –A, B, and C, – is to make a decision on the basis of a majority vote. What is the probability of a wrong decision by the committee if the probabilities of a wrong decision by each member are $P(A) = 0.05$, $P(B) = 0.05$, and $P(C) = 0.10$? **(05)**

b) The contents of two urns are as follows: **(06)**
Urn A contains 3 red and 2 white balls. Urn B contains 2 red and 5 white balls. An urn is selected at random; a ball is drawn and put into the other urn; then a ball is drawn from the second urn. Find the probability that both balls drawn are of the same colour.

c) Show that the multiplication law $P(A \cap B) = P(A/B)\,P(B)$, established for two events. **(04)**

Q.8 a) Verify that E(X) + E(Y) = E(X + Y) by using the random variable X with the p.d. $f(x) = \frac{1}{4}$, **(06)**

x = 1, 2, 3, 4, and the r.v. Y with the p.d. $f(y) = \binom{3}{y}\left(\frac{1}{2}\right)^{y}\left(\frac{1}{2}\right)^{3-y}$,

y = 0, 1, 2, 3.

b) Let X1 and X2 be two independent r.v.'s having variances k and 2 respectively. If Var(3X2 – X1) = 25, find k. **(03)**

c) Given the joint p.d. of two r.v.'s X and Y, whose values f(x, y) **(06)**
are $f(1, 1) = \frac{6}{30}$, $f(1, 2) = \frac{1}{30}$, $f(1, 3) = \frac{1}{30}$, $f(2, 1) = \frac{4}{30}$,
$f(2, 2) = \frac{5}{30}$, $f(2, 3) = \frac{1}{30}$, $f(3, 1) = \frac{2}{30}$, $f(3, 2) = \frac{4}{30}$,
$f(3, 3) = \frac{6}{30}$, find all the marginal and conditional distributions.

Q.9 a) Suppose that the number of insurance claims closely approximates a Poisson distribution with $\mu = 0.05$. Find the probability of (i) no claim and (ii) 1 or fewer claims. **(04)**

b) Ten vegetable cans, all the same size, have lost their labels. It is known that 5 contain tomatoes and 5 contain corn. If five are selected at random, what is the probability that all contain tomatoes? What is the probability that 3 or more contain tomatoes? **(05)**

c) If 60% of the voters in a large district prefer candidate A, what is the probability that in a sample of 12 voters exactly 7 will prefer A?, less than 7 prefer A, at least 8 prefer A **(06)**

Q.10 a) Derive the mean and standard deviation of Uniform distribution. **(04)**

b) i) For what value of A, the function defined as below will be a p.d.f.? **(2+3+2)**

$$f(x) = Ax^3(1-x), \quad 0 \le x \le 1$$
$$= 0, \qquad \text{otherwise}$$

ii) Find its mean and variance. iii) find $P\left(\frac{1}{4} < X < \frac{1}{2}\right)$, using its distribution function.

c) Scores on a certain nation-wide college entrance examination follow a normal distribution with a mean of 500 and a standard deviation of 100. Find the probability that a student will score (i) over 650, (ii) less than 250 **(04)**