Subject: Statistics-I
PAPER: A (Statistics-I)

TIME ALLOWED: 3 hrs.
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) Define sample, what are its properties? **(2+3)**
b) Compare ratio and interval scales of measurements. **(03)**
c) A survey of retail establishments had assistants as follows: **(07)**

2, 3, 9, 0, 4, 4, 1, 5, 4, 8, 5, 3, 6, 6, 0, 2,
2, 7, 6, 4, 8, 4, 3, 3, 1, 0, 8, 7, 5, 1, 3, 4, 2, 4, 7,
5, 2, 6, 3, 1, 7, 5, 4, 6, 4, 2, 5, 3, 4

Arrange the values as a frequency distribution with proper class interval and number of classes.

Q.2
a) What are the principal criteria for a satisfactory average? State giving reasons the circumstances in which it would be preferable to use the Arithmetic mean **(4+3)**
b) Calculate the standard deviation of the following frequency distribution showing the weights of apples: **(04)**

Weight (grams)	65–84	85–104	105–124	125–144	145–164	165–184	185–204
f	9	10	17	10	5	4	5

c) Prove that the sum of squared deviations from arithmetic mean is smallest. **(04)**

Q.3
a) Differentiate between simple and composite Index numbers. **(04)**
b) Prove that the simple aggregate value index numbers $\left(i.e. \dfrac{\Sigma p_n q_n}{\Sigma p_0 q_0} \right)$ satisfy the time reversal and circular tests. **(04)**
c) From the data given below, compute the index numbers of prices, taking 1980 as base. Use simple average of price relatives. **(07)**

Year	Commodity (Prices in Rs.)			
	A	B	C	D
1980	16.25	20.00	2.40	10.50
1981	17.22	22.40	2.64	12.50
1982	19.55	16.00	3.00	12.60
1983	18.70	20.00	3.80	14.65

Q.4
a) When do you compute the deviations from trend and when ratios to trend? Explain how you eliminate the average seasonal variations from the observed values of the time series. **(08)**
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) Write the assumptions of simple linear regression model. **(05)**
b) Given the following set of values: **(10)**

X	20	11	15	10	17	19
Y	5	15	14	17	8	9

i) Determine the equation of the least squares regression line of Y on X.
ii) Find the predicted values of Y for X = 10, 11, 15, 17, 19, 20.
iii) Use the predicted values found in (ii) to find the standard error of estimate. **PTO**

Q.6 **a)** Differentiate between; i) trial and event   ii) experiment and random experiment   **(06)**
   b) A club consists of four members. How many sample points are in the sample space   **(2+2)**
   when three officers: president, secretary and treasurer, are to be chosen? Justify your
   procedure to be used.
   c) Two dice are rolled. Let A be the event that the sum of dots on the faces shown is odd,   **(05)**
   and B the event that there is at least one 3 shown. Describe $A \cup B$; $A \cap B$; and
   $(A \cap \overline{B}) \cup \overline{A}$.

Q.7 **a)** Two drawings each of three balls are made from a bag containing 5 white and 8 black   **(04)**
   balls; the balls are not being replaced before the next trial. What are the probabilities
   that the first drawing will give 3 white balls and the second 3 black balls?
   b) There are three families, each having four children; 2 boys and 2 girls; 3 boys and 1   **(05)**
   girl; and 1 boy and 3 girls. A child from each family is invited to a party. Find the
   probability (i) that only girls turn up for the party, (ii) that two girls and one boy turn up
   for the party.
   c) There are three coins, identical in appearance, one of which is ideal and the other two   **(06)**
   biased with probabilities 1/3 and 2/3 respectively for a head. One coin is taken at
   random and tossed twice. If a head appears both the times, what is the probability that
   the ideal coin was chosen?

Q.8 **a)** Differentiate between probability function and Distribution function (a discrete case).   **(04)**
   Also write example(s) in support of your answer.
   b) An urn contains 3 black, 2 red and 3 green balls and 2 balls are selected at random   **(06)**
   from it. If X is the number of black balls and Y is the number of red balls selected, then
   find
   i)   the joint probability function f(x, y);   ii) P(X + Y $\leq$ 1);
   iii) the marginal p.d. g(x) and h(y);   iv) the conditional p.d. f(x | 1),
   v) Are X and Y independent?
   c) If $f(x) = \dfrac{6 - |7 - x|}{36}$, for x = 2, 3, 4, …12. Then find the mean and variance of the   **(05)**
   random variable x.

Q.9 **a)** Write the properties of a Binomial experiment.   **(04)**
   b) A and B play a game in which A's probability of winning is 2/3. In a series of 8 games,   **(06)**
   what is the probability that A will win (i) at least 4 games, (ii) 6 or more games, and
   (iii) from 3 to 6 games?
   c) During a promotional campaign of a new drink, a soft drink company places prize-   **(05)**
   winning caps on one of every ten bottles. Hoping to win a prize, a child decides to buy
   a bottle of a new cola each day for one full week. What is the probability that the child
   win prize(s)?   i) at least one day?   ii) first two days?   iii) all days?

Q.10 **a)** Derive the mean and variance of uniform distribution U(a,b).   **(05)**
   b) A normal distribution has mean = 12 and σ =2, find the area under the curve   **(05)**
   a) from X=10 to X=13.5,   b) from X=11.4 to X=14.2,
   c) In a normal distribution with μ =47.6 and σ =16.2, find (i) the probability that a single   **(05)**
   observation will be larger than 50, (ii) two points such that a single observation has a
   97% probability of falling between them