UNIVERSITY OF THE PUNJAB

B.A. / B.Sc. Part – I Annual Exam – 2019

Roll No. .....

Subject: Statistics-I **Paper: A (Statistics-I)** **Time: 3 Hrs. 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 statistics and explain its characteristics, also define descriptive and inferential statistics. (4)

b) Show that for the numbers a and b that $G = \sqrt{AH}$ where A is mean G is Geometric mean and H is Harmonic mean. (5)

c) Following data have been obtained from a frequency distribution of a continuous variable x after making the substitution u = x – 136.5/2 (6)

U	-3	-2	-1	0	1	2
f	5	8	18	22	13	8

Find Geometric mean and Harmonic mean

Q.2 a) Show that $\sum(x-a)^2 = \sum(x-\bar{x})^2 + n\sum(\bar{x}-a)^2$ (3)

b) Calculate co-efficient of variation for the given data **(4)**

$n = 120 \quad \sum fu = 140 \quad \sum fu^2 = 598$ where $u = \frac{x-144.5}{10}$

c) Given the following (8)

$\sum f = 76 \quad \sum fx = 572 \quad \sum fx^2 = 4848 \quad \sum fx^3 = 44240 \quad \sum fx^4 = 425280$, Test for symmetry and normality

Q.3 a) Show that Marshal edgeworth index satisfies the time – reversal test but not factor reversal test? (5)

b) Given. [7+3]=10

Commodity	Quantity		Value	
	2001	2006	2001	2006
A	100	150	600	1200
B	80	100	400	700
C	60	72	180	432
D	30	33	450	360

Compute following

i)Fishers quantity index number for 2006

ii) Simple aggregative value index for 2006

Q.4 a) What is rank correlation. Derive spearmen co-efficient of rank correlation? 2+5=[7]

b) i) Calculate co-efficient of correlation for a sample of 20 pairs of observation given that : 3+3+2=(8)

$\bar{x} = 2 \quad \bar{y} = 8 \quad \sum x^2 = 180 \quad \sum y^2 = 1424$ and $\sum xy = 404$

ii) Also determine the estimated regression equation $\hat{y} = a + bx$

iii) Calculate the standard deviation of regression $s_{y.x}$.

Q.5 a) Describe the different components of time series? Discuss the measurement technique of secular trend. (5)

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b) Compute the indices of seasonal variation by the ratio- to -trend method by fitting a least square straight line trend for the data. (10)

Years	Quarter			
	i	ii	iii	iv
2001	72	98	79	106
2002	79	122	101	143
2003	94	141	128	160
2004	125	143	135	187

Use the seasonal indices to deseasonalize the 2004 value?

Section II

Q.6 a) Define the term random experiment, sample space,outcome, event? (4)

b) Three distinct integer are chosen at random from the first 20 positive integer compute the probability that (6)

i) their sum is even ii) their product is even.

c) A missile is fired at a target and the probability that the target is hit 0.7, Find how many missile should be fired so that the probability that target is hit at least one, is greater than 0.995? (5)

Q.7 a) State and prove the addition law of probability for any two events A and B? (5)

b) A box contain 4 bad and 6 good tubes, Two are drawn out together one of them is tested and found to be good what is the probability that the other one is also good? (5)

c) What is the probability that a randomly selected poker hand contain exactly 3 Aces given that it contain at least 2 Aces? (5)

Q.8 a) Define a discrete random variable and its probability distribution function and what are its properties? (4)

b) A man draws 2 balls from a bag containing 3 white and 5 black balls, If he received Rs 70 for every white ball he draws and Rs 7 for every black ball. Find his expectation? (5)

c) X and Y are two independent random variables such that (6)

$g(x) = 1/3$ for $x = 1,2,3,$

$h(y) = 1/2$ for $y = 0,1$

If $Z = 2x - y$, Than verify that $E(z) = 2E(x) - E(y)$.

Q.9 a) Show that the m.g.f of the sum of two independent random variable is the product of their moment generating functions? (4)

b) Define the Poisson distribution and derive its mean and variance? (6)

c) A home owner plants 6 bulbs selected at random from a box containing 4 tulip bulbs and 4 daffodils bulbs and 4 tulip bulbs what is the probability that he planted 2 daffodils and 4 tulip bulbs? (5)

Q.10 a) i) Find the value of K so that the function f(x)defined as follows may be a density function ? (6)

$f(x) = Kx \qquad 0 \leq x \leq 2$

$= 0 \qquad$ Otherwise

ii) Find also the probability that both of two sample value will exceed one?

iii) Compute the distribution function F(x)?

b) Define the normal distribution and obtain its mean? (4)

c) The mean life of stocking used by an army was 40 days with standard deviation of 8 days. Assume the life of stocking follows the normal distribution, if 1000 pairs are issued how many would need replacement before 35 days, after 46 days? (5)

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B.A. / B.Sc. Part – 1 Annual Exam – 2019

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SECTION-I

Q.1 a) What do you mean by a Statistical Population? Describe its types? **(2+3)**

b) Compare Nominal and Ordinal scales of measurements. **(03)**

c) Arrange the data given below in a frequency distribution, using proper class interval. **(07)**

79.4	71.6	95.5	73.0	74.2	81.8	90.6	55.9
75.2	81.9	68.9	74.2	80.7	65.7	67.6	82.9
88.1	77.8	69.4	83.2	82.7	73.8	64.2	63.9
68.3	48.6	83.5	70.8	72.1	71.6	59.4	77.6

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 geometric mean **(4+3)**

b) A computer calculated mean and standard deviation from 20 observations as 42 and 5 respectively. It was later discovered at the time of checking that it had copied down two values as 45 and 38 respectively, where the correct values were 35 and 58. Find correct value of co-efficient of variation. **(05)**

c) Describe the merits and demerits of median. **(03)**

Q.3 a) Distinguish between fixed base and chain base methods of constructing index numbers. **(04)**

b) Prove that the simple aggregate value index numbers $\left(i.e. \frac{\sum p_n q_n}{\sum p_0 q_0} \right)$ satisfy the time reversal but do not satisfy the factor reversal test. **(04)**

c) Construct chain indices taking 1990 as base using A.M as average. **(07)**

Item / Year	1990	1991	1992	1993	1994
A	28	34	36	40	42
B	105	108	106	110	115
C	27	32	35	38	40

Q.4 a) What is meant by seasonal variation? Explain how seasonal variations are measured and removed from the time series data? **(08)**

b) A merchant's sale ('00s tons) of ordinary coal over a period were as shown below: Construct seasonal indices, using the percentage of annual-average method. **(07)**

YEARS	Quarters			
	I	II	III	IV
1996	118	87	47	83
1997	94	73	41	68
1998	73	61	36	56

Q.5 a) Write the properties of least square regression line. **(05)**

P.T.O.

b) The owner of a retailing organization is interested in the relationship between price at which a commodity is offered for sale and the quantity sold. The following sample data have been collected. (10)

Price	25	45	30	50	35	40	65	75	70	60
Quantity sold	118	105	112	100	111	108	95	88	91	96

i) Using the method of least squares, determine the equation for the estimated regression line.

ii) Find standard error of estimate.

SECTION-II

Q.6 a) Define with example (06)

i) Mutually Exclusive events ii) Exhaustive events iii) Independent events

b) A three-person committee is to be formed from a list of four persons. How many sample points are associated with the experiment? Justify your procedure to be used. (2+2)

c) Of 12 eggs in a refrigerator, 2 are bad. From these, 4 eggs are chosen at random to make a cake. What are the probabilities that (i) exactly one is bad? (ii) at least one is bad? (2+3)

Q.7 a) A can hit a target four times in 5 shots; B three times in 4 shots; C twice in 3 shots. They fire a volley. What is the probability that two shots at least hit? (04)

b) The national pass rate for an examination is 40%. A school enters 6 candidates. Calculate the probability that (i) 2 candidates will pass, and (ii) 5 candidates will pass. Explain why the probability of all passing is not equal to the probability of all failing. (05)

c) In a certain college, 4% of the men and 1% of the women are taller than 6 feet. Further more, 60% of the students are women. Now if a student is selected at random and is taller than 6 feet, what is the probability that the student is a woman? (06)

Q.8 a) Differentiate between joint and marginal probabilities (discrete case); write at least one example in support of your answer. (05)

b) A large store places its last 15 clock radios in a clearance sale. Unknown to anyone, 5 of the radios are defective. If a customer tests 3 different clock radios selected at random, what is the p.d. of X = number of defective radios in the sample (04)

c) Let X and Y have the joint probability functions given by (06)

i) $f(x, y) = Kxy$ x = 2, 4,; y = 1, 2,

ii) $f(x, y) = cxy^2$ x = 1, 2,; y = 1, 2.

Find the constants 'K' and 'C' also the marginal probability functions of X and Y

Q.9 a) Compare Binomial and Poisson random variables. (04)

b) The experience of a house-agent indicates that he can provide suitable accommodation for 75 percent of the clients who come to him. If on a particular occasion, 6 clients approach him independently, calculate the probability that (06)

(i) less than 4 clients, (ii) exactly 4 clients,

(iii) at least 5 clients, will get satisfactory accommodation.

c) The painted light bulbs produced by a company are 50% red, 30% blue and 20% green. In a sample of 5 bulbs, find the probability that 2 red, 1 is green and 2 are blue. (05)

Q.10 a) Prove that the mean deviation of the normal distribution is approximately 4/5 of its standard deviation. (04)

b) The height of boys at a particular age follows 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 group has height (i) Less than 153 cm (ii) More than 145 cm. (05)

c) The mean score of 1000 students appearing for an examination is 34.4 and the standard deviation is 16.6. How many candidates may be expected to obtain marks between 30 and 60 assuming the normality of the distribution? Under the same assumptions, determine also the limits of marks of the central 70% of the candidates. (06)