



**PUNJAB PUBLIC SERVICE COMMISSION**  
**COMBINED COMPETITIVE EXAMINATION**  
**FOR RECRUITMENT TO THE POSTS OF**  
**PROVINCIAL MANAGEMENT SERVICE -2020**

**SUBJECT: STATISTICS (PAPER-I)**

**TIME ALLOWED: THREE HOURS**

**MAXIMUM MARKS: 100**

**NOTE:**

- i. All the parts (if any) of each Question must be attempted at one place instead of at different places.
- ii. Write Q. No. in the Answer Book in accordance with Q. No. in the Q. Paper.
- iii. No Page/Space be left blank between the answers. All the blank pages of Answer Book must be crossed.
- iv. Extra attempt of any question or any part of the question will not be considered.

**ATTEMPT FIVE QUESTIONS IN ALL. CALCULATOR IS ALLOWED (NOT PROGRAMMABLE)**

**Q. No. 1 a)** Differentiate between quantitative variable and qualitative variable.

**b)** The ages of 30 patients admitted to a certain hospital during a particular week were as follows:

48, 31, 54, 37, 18, 64, 61, 43, 40, 71, 51, 12, 52, 65, 53, 42, 39, 62, 74, 48, 29, 67, 30, 49, 68, 35, 57, 26, 27, 58.

Construct a stem and leaf display from the data and list the data in an array.

**c)** Find Median for the following data.

Marks	10-19	20-29	30-39	40-49	50-59	60-69	70-79
No. of Students	2	3	5	6	6	6	2

**(4 + 8 + 8 = 20 Marks)**

**Q. No. 2 a)** Write down the properties of variance.

**b)** Goals scores by two teams A and B in a football season were as follows.

Goals Scored	No. of Matches (Team A)	No. of Matches (Team B)
0	27	17
1	9	9
2	8	6
3	5	5
4	4	3

By calculating the coefficient of variation in each case, find which team may be considered more consistent.

**(8 + 12 = 20 Marks)**

**Q. No. 3 a)** Four items are taken at random from a box of 12 items and inspected. The box is rejected,

if more than 1 item is found to be faulty. If there are 3 faulty items in the box, find the probability that the box is accepted.

**b)** Find the probability distribution and distribution function for the number of heads when 3 balanced coins are tossed.

**(8 + 12 = 20 Marks)**

**P.T.O**



**Q. No. 4 a)** Find the value of  $k$  so that the function  $f(x)$  defined as follows may be a density function.

$$f(x) = \begin{cases} kx, & 0 \leq x \leq 2 \\ 0, & \text{elsewhere} \end{cases}$$

Find its mean and variance.

**b)** The joint probability distribution function of two discrete random variables  $X$  and  $Y$  is given by:

$$f(x, y) = \frac{xy^2}{30} \text{ for } x = 1, 2, 3 \text{ and } y = 1, 2.$$

Are  $X$  and  $Y$  independent?

**(12 + 8 = 20 Marks)**

**Q. No. 5 a)** Derive mean and variance of the poisson distribution.

**b)** An urn contains 4 red balls and 6 black balls. A sample of 4 balls is selected from the urn without replacement. Let  $X$  be the number of red balls contained in the sample. Then find the probability distribution of  $X$ .

**(10 + 10 = 20 Marks)**

**Q. No. 6 a)** Prove that area under the normal distribution curve is unity.

**b)** A random variable  $X$  is normally distributed with  $\mu = 50$  and  $\sigma^2 = 25$ . Find the probability that

(i) It will fall between 55 and 100.

(ii) It will be larger than 54.

(iii) It will be smaller than 57.

**(10 + 10 = 20 Marks)**

**Q. No. 7 a)** Prove that correlation coefficient is independent of origin and scale. i.e.  $r_{xy} = r_{uv}$

**b)** Compute the least square regression equation of  $y$  on  $x$  for the following data.

$x$	5	6	8	10	12	13	15	16	17
$y$	16	19	23	28	36	41	44	45	50

Also show that  $\sum(Y - \hat{Y}) = 0$

**(10 + 10 = 20 Marks)**

**Q. No. 8 a)** Fit an equation of the form  $Y = aX^b$  to the following data.

$x$	1	2	3	4	5	6
$y$	2.98	4.26	5.21	6.10	6.80	7.50

**b)** Fit a second degree parabola to the following data taking  $x$  as independent variable.

$x$	0	1	2	3	4
$y$	1	1.8	1.3	2.5	6.3

**(8 + 12 = 20 Marks)**

