



PUNJAB PUBLIC SERVICE COMMISSION
COMBINED COMPETITIVE EXAMINATION
FOR RECRUITMENT TO THE POSTS OF
PROVINCIAL MANAGEMENT SERVICE, ETC -2021
CASE NO. 3C2022

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) Write down empirical relation between mean, median and mode.

(b) Find the median, quartiles and the 8th decile for the distribution of examination marks given below:

Marks	30-39	40-49	50-59	60-69	70-79	80-89	90-99
No of student	8	87	190	304	211	85	20

(4+16=20 Marks)

Q.No.2 (a). Describe the properties of standard deviation.

(b) By multiplying each of the number 3,6,2,1,7,5 by 2 and then adding 5 we get 11,17,9,7,19,15 what is the relation between the standard deviation and the mean for the two sets.

(c) The breaking strength of 20 test pieces of a certain allow is given as under

95,103,97,130,96,73,78,95,89,68,82,79,69,67,83,108,94,87,93,117

Show that Mean deviation=(4/5)Standard deviation.

(4+8+8=20 Marks)

Q.NO.3. (a) Box A contains 5 green and 7 red balls .Box B contains 3 green ,3 red and 6 yellow balls. A box is selected at random and a ball is drawn at random from it. What is the probability that ball drawn is green,

(b) Let X and Y be two discrete random variables with the following joint p.d

Y\X	2	4
1	0.10	0.15
3	0.20	0.30
5	0.10	0.15

Show that $E(XY)=E(X)E(Y)$

(10+10=20 Marks)

Q.No.4. (a) Let X be random variable with p.d.f.

$$f(x) = 2(x-1) \quad 1 < x < 2$$

Find the $E(2X-1)$ and $E(X^2)$.

(b) Let X and Y have the joint p.d.f described as follows.

(x,y)	(1,1)	(1,2)	(1,3)	(2,1)	(2,2)	(2,3)
f(x,y)	2/15	4/15	3/15	1/15	1/15	4/15

and $f(x,y)$ is equal to zero elsewhere. Find the two marginal p.d.f's and the correlation coefficient.

(10+10=20 Marks)

Q.No.5. (a) A certain event is believed to follow the Binomial distribution. In 1024 samples of 5, the result was observed once 405 times and twice 270 times. Find p and q.

(b) A random sampling of 4 members of a 150 members club has shown that 3 prefer no smoking in the clubhouse dining room. What is the probability that this will occur if in fact only 20% of members prefer no smoking in the dining room. Find this probability assuming that the sample was obtained under

i) sampling without replacement, and

ii) sampling with replacement.

Compare the two answers.

(10+10=20 Marks)

Q.No.6. (a) For a normal distribution prove that mean=median=mode= μ .

(b) A random variable X is normally distributed with mean $\mu=166$ and $\sigma = 20$. Find

i) $P(170 < X < 200)$ ii) $P(148 < X < 172)$

(10+10=20 Marks)

Q.No.7 (a) If n pairs of values of two variables a and b are given, whereas each variable is ranked in order(1 to n), show that the coefficient of correlation between ranks is given by

$$r_s = 1 - (6 \sum d^2 / (n(n^2-1)))$$

(b) Obtain the product moment coefficient of correlation between following values

a	7.4	9.0	11.0	2.5	4.6	6.4
b	8.5	6.1	2.4	6.7	12.6	3.3

Rank the values and hence find a rank correlation between the two sets

(6+14=20 Marks)

Q.No.8 (a) Given the following pairs of values of X and Y.

X	0	1	2	3	4
Y	10	17	28	43	62

Fit a suitable curve.

(b) The following data represent concomitants values of three variables

X_1	32	18	52	16	42	48
X_2	3	2	5	1	4	6
X_3	2	4	2	5	3	9

Calculate all the multiple correlation coefficients.

(10+10=20 Marks)