

# PUNJAB PUBLIC SERVICE COMMISSION

## COMBINED COMPETITIVE EXAMINATION FOR RECRUITMENT TO THE POSTS OF PROVINCIAL MANAGEMENT SERVICE, ETC. - 2015

### SUBJECT: STATISTICS (OPTIONAL) PAPER-I

TIME ALLOWED: THREE HOURS

MAXIMUM MARKS: 100

Note: Attempt any FIVE questions. Calculator is allowed.

Q.1. (a) The following are the scores made by two batsmen A & B in a series of innings.

A: 12, 15, 6, 7, 73, 71, 19, 199, 36, 84, 29

B: 47, 12, 76, 48, 4, 51, 37, 48, 13, 0

Who is the more consistent player?

(b) The first four moments of a distribution about  $x = 2$  are 1, .5, 5.5 and 16. Calculate first four moments about mean and about zero.

Q.2. (a) A card is drawn at random from a deck of ordinary playing cards. What is the probability that it is a Diamond or a face card or a king.

(b) Three cooks A, B and C bake a special kind of cake, and with respective probabilities 0.02, 0.03 and 0.05 it fails to rise. In the restaurant where they work, A bakes 50 percent of these cakes, B 30 percent and C 20 percent. What proportions of failures is caused by A.

Q.3. Let  $x$  and  $y$  be two discrete random variables with the following joint probability distribution.

|       |      |      |
|-------|------|------|
| $x/y$ | 2    | 4    |
| 1     | 0.10 | 0.15 |
| 3     | 0.20 | 0.30 |
| 5     | 0.10 | 0.15 |

Find

(i) Mean of the variable  $x$  and mean of the variable  $y$ .

(ii) Show that  $E(x+y) = E(x) + E(y)$

(iii) Show that  $E(2x - 3y) = 2E(x) - 3E(y)$

(iv) Are  $x$  and  $y$  independent

Q.4. A continuous random variable  $x$  has the P.d.f given by  $f(x) = k(2-x)(x-5)$ ,  $2 \leq x \leq 5 = 0$  otherwise find the value of (i)  $k$  (ii) Mean (iii) Variance (iv) Mode (v) Median

Q.5. (a) Show that the mean and variance of Poisson Distribution are equal.

(b) Determine the probability that the income tax Authorities will catch three Income Tax Returns with illegitimate deductions, if it randomly selects six returns from among 20 income tax returns of which 8 contains illegitimate deductions.

Q.6. (a) Derive the mean and variance of continuous uniform probability distribution.

(b) If the m.g.f of  $x$  is  $M(t) = e^{-6t+32t^2}$  then find (i)  $P(-4 \leq x \leq 0)$  (ii)  $P(-10 \leq x \leq 0)$

(Table value are for  $z = 0.25$  is 0.0987

$z = 2.75$  is 0.4970

$z = 0.75$  is 0.2734

$z = 0.50$  is 0.1915)

Q.7. (a) Show that the correlation Coefficient is independent of change of origin & scale.

(b) Fit an exponential curve  $y = a e^{bx}$  to the following data

X: 1      2      3      4      5      6

Y: 1.6    4.5    13.8    40.2    125.0    363.0

Also estimate Y for  $x = 7$

Q.8. (a) Compute the Coefficient of Rank correlation for the following ranks:

X: 8      3      6.5      3      6.5      9      3      1      5

Y: 8      9      6.5      2.5      4      5      6.5      1      2.5

(b) Calculate the multiple Correlation Coefficient  $R_{2.13}$  and the Partial Correlation Coefficient  $r_{23.1}$  from the values given below:

$b_{12} = -0.1$ ,     $b_{21} = -0.4$ ,     $b_{13} = 0.27$

$b_{31} = 0.6$ ,     $b_{23} = 0.67$ ,     $b_{32} = 0.38$