FEDERAL PUBLIC SERVICE COMMISSION
COMPETITIVE EXAMINATION - 2016
FOR RECRUITMENT TO POSTS IN BS-17
UNDER THE FEDERAL GOVERNMENT

Roll Number

STATISTICS

TIME ALLOWED: THREE HOURS	**PART-I (MCQS)**	**MAXIMUM MARKS = 20**
PART-I(MCQS): MAXIMUM 30 MINUTES	**PART-II**	**MAXIMUM MARKS = 80**

NOTE: (i) **Part-II** is to be attempted on the separate **Answer Book.**
(ii) Attempt **ONLY FOUR** questions from **PART-II** by selecting **TWO** questions from **EACH SECTION. ALL** questions carry **EQUAL** marks.
(iii) All the parts (if any) of each Question must be attempted at one place instead of at different places.
(iv) Candidate must write Q. No. in the Answer Book in accordance with Q. No. in the Q.Paper.
(v) No Page/Space be left blank between the answers. All the blank pages of Answer Book must be crossed.
(vi) Extra attempt of any question or any part of the attempted question will not be considered.
(vii) **Use of Calculator is allowed.**

PART-II
SECTION-I

Q. No. 2. **(a)** Describe the importance of skewness and kurtosis. Also give the major characteristics of a frequency distribution. **(8)**

(b) The fourth mean moment of a symmetrical distribution is 243. What would be the value of the standard deviation in order that the distribution may be mesokurtic? **(6)**

(c) Find the arithmetic, geometric and harmonic means of the series: **(6)**
$1, 2, 4, 8, 16, ..., 2^n$.

Q. No. 3. **(a)** Describe the importance of hypergeometric probability distributions. In reality where we can use it? **(8)**

(b) If N becomes indefinitely large, the hypergeometric probability distribution tends to the binomial probability distribution. Prove it. **(6)**

(c) A continuous r.v. X has the p.d.f., given by **(6)**
$f(x) = w(2-x)(x-5),\ 2 \le x \le 5 = 0,$ otherwise
Find the value of w, mean and variance. What are the values of the mode and median of the distributions of X?

Q. No. 4. **(a)** What are the assumptions made in a linear regression. Give the important uses of regression analysis? **(8)**

(b) Differentiate between correlation and regression with two real life examples. **(6)**

(c) The following measurements show the respective heights in inches of ten fathers (X) and their eldest sons (Y). **(6)**

X	67	63	66	71	69	65	62	70	61	72
Y	68	66	65	70	69	67	64	71	60	63

(i) Find the regression line of Y on X.
(ii) Estimate Y for the given X as 70 inches.
(iii) Test the significance of the population regression coefficient β_{yx}.
(iv) Calculate 95% confidence limits for β_{yx}.
(v) Test the significance of the intercept of the lines Y on X.
(vi) Find the regression line of X on Y.

Q. No. 5. **(a)** What are the steps involved in any nonparametric test of hypothesis. **(8)**

(b) Describe briefly Kolmogorov-Smirnov test of goodness of fit in case of one and two samples. **(6)**

(c) Following is a sequence of heads (H) and tails (T) in tossing of a coin14 times, $HTTHHHTHTTHHTH$. Test whether the heads and tails occur in random order,[Given: For $\alpha = 5\%$, $r_L = 2$, $r_u = 12$]. **(6)**

SECTION-II

Q. No. 6. **(a)** Describe the importance of sampling. Also discuss sampling with and without replacement. **(8)**

(b) What steps should keep in mind to determine the sample size? **(6)**

(c) A population consists of $N = 7$ numbers, 1, 1, 2, 3, 4, 4, 5. **(6)**
Draw all possible sample of size $n = 3$ without replacement from this population and find the sample properties of odd numbers in the samples. Construct the sampling distribution of sample proportion and verify:

(i) $E(p) = P$ and (ii) $E(p) = \left(\frac{N-n}{N-1}\right)\frac{PQ}{n}$.

Q. No. 7. **(a)** Differentiate between simple and composite hypothesis. Also discuss the role of "Test of significance". **(8)**

(b) In a random sample of 500 men from Lahore city, 300 are found to be smokers. In one of 1000 men from Karachi city, 550 are smokers. Do the data indicate that the two cities are significantly different with respect to the prevalence of smoking among men? **(6)**

(c) Test the hypothesis given in the following table that the variances of three populations are equal at $\alpha = 5\%$. **(6)**

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

Q. No. 8. **(a)** What is meant by Analysis of Variance and degrees of freedom? What are the assumptions underlying a one-way analysis of variance? **(8)**

(b) Given the following information: **(6)**

	Samples			
	1	2	3	4
Observations (n_i)	4	6	7	3
Sample means $(\bar{y}_i)$	58	57	43	42
Estimate of variance (s_i^2)	10	30.4	5.67	9

Construct an analysis of variance table and test the hypothesis that the population means are equal at $\alpha = 5\%$.

(c) Describe the role of Pakistan Bureau of Statistics and NADRA. **(6)**

****