FEDERAL PUBLIC SERVICE COMMISSION
COMPETITIVE EXAMINATION - 2017
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)** Suppose a set of observations has mean $\bar{X}$ and variance s^2. What happens to the mean and variance if each score is divided by s and then $\bar{X}$ is subtracted from each quotient? Is the result same if you first subtract $\bar{X}$ from each score and then divide the difference by s? **(8)**

(b) Calculate **(12)**
(i) S. D **(ii)** Co-efficient of variation
(iii) Co-efficient of Skewness and discuss the result from the following weekly wages of 300 workers.

Weekly wages	Below 5	Below 10	Below 15	Below 20	Below 25	Below 30	Below 35
No. of workers	7	78	120	189	205	275	300

Q. No. 3. **(a)** If the probability that an individual suffers a bad reaction of a given serum is 0.001, determine the probability that out of 2000 individuals (a) exactly 3 and (b) more than 2 individuals will suffer a bad reaction. Find the answer using both poisson and the binomial distributions. **(8)**

(b) A random variable to assume the value 1 with probability p, with probability q = 1 - p. Prove that (a) E(X) = p and (b) $E[(X - \bar{X})^2] = pq$. **(6)**

(c) An experiment consists of drawing three cards in succession from a well-shuffled ordinary deck of cards. Let E_1 be the event "king" on the first draw, E_2 be the event "king" on the second draw, E_3 be the event "king" on the third draw. State in words the meaning of each of the following: **(6)**

(i) $pr\{E_1\bar{E}_2\}$ (ii) $\bar{E}_1 + \bar{E}_2$ (iii) $\bar{E}_1\bar{E}_2\bar{E}_3$

(iv) $pr\{E_1 + E_2\}$ (v) $pr\{\bar{E}_3|E_1\,\bar{E}_2\}$ (vi) $pr\{E_1E_2 + \bar{E}_2E_3\}$

Q. No. 4. **(a)** What is regression model? Write the assumptions made in a linear regression. Also proof the Comment on the unbiasedness of regression estimates. **(8)**

(b) Calculate coefficient of correlation by the method of least squares for the following paired values of X and Y variables. Also verify that this value of r is same as that obtained by pearson's formula. **(12)**

X	10	12	13	17	18
Y	5	6	7	9	13

SECTION-II

Q. No. 5. **(a)** Discuss time reversal test and explain the factor reversal test. **(8)**

(b) Per capita income of a person from 1980-81 to 1986-87 and the consumer price index with 1980-81 were as follows: **(12)**

Year	Income per capita (Rs)	Index Nos.
1980-81	1627	100
1981-82	1851	103.5
1982-83	1993	103.4
1983-84	2290	109.4
1984-85	2494	110.9
1985-86	2735	113.8
1986-87	2970	115.6

Find real wages and real income indices.

Q. No.6. **(a)** What is the difference between population census and vital statistics? What are the various uses of vital statistics for a country? **(8)**

(b) The population and its distribution by sex and number of births in a tehsil in 1991 and survival rates are given below: **(12)**

Group	Population	Males	Females	Male birth	Female birth	Total birth	Survival rate
15-19	11832	6145	5687	65	60	125	0.91
20-24	10538	5214	5324	144	132	276	0.90
25-29	9375	4655	4720	135	127	262	0.84
30-34	7843	3910	3933	82	81	163	0.87
35-39	7270	3600	3670	62	56	118	0.85
40-44	6315	3290	3025	12	15	27	0.83
45-49	5394	2793	2601	3	3	6	0.82
Total	58567	29607	28960	503	474	977	

From the given data, calculate

(i) General fertility rate
(ii) Age specific fertility rate
(iii) Total fertility rate
(iv) Gross production rate
(v) Net reproduction rate

Assuming no mortality.

Q. No. 7. **(a)** Given the following data obtained from a completely randomized design with four treatments; analyse the given data and draw conclusion about the equality of treatment effects. **(8)**

Treatments			
T_1	T_2	T_3	T_4
20.9	23.7	13.2	5.8
12.4	14.4	10.2	6.1
10.1	9.0	5.1	4.8
4.2			1.5

(b) Give Statistical model for completely randomized design with one observation per unit. **(6)**

(c) What is the role of randomization in the process of the experimentation? Discuss and define experimental error. What factors are responsible for determining the number of replications? **(6)**

Q.No.8. **(a)** A random sample of 100 workers in a farm took an average of 14 minutes to complete a task. A random sample of 150 workers in another large farm took an average of 11 minutes to complete the task. Can it be assumed at 1% level of significance that the average time taken by the workers in the two farms is same, if the S.D. of the workers of first farm and second farm are 2 minutes and 3 minutes respectively? **(8)**

(b) Describe the general procedure for testing a hypothesis about a difference between population mean, when sample size is large. **(6)**

(c) Distinguish between: **(6)**

(i) Sampling error and non-sampling error

(ii) Sampling with replacement and without replacement

(iii) Probability and non-probability Sampling

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