FEDERAL PUBLIC SERVICE COMMISSION
SPECIAL COMPETITIVE EXAMINATION-2023 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) First attempt **PART-I (MCQs)** on separate **OMR Answer Sheet** which shall be taken back after **30 minutes.**
(ii) Overwriting/cutting of the options/answers will not be given credit.
(iii) There is **no negative** marking. All MCQs must be attempted.

PART-I (MCQs)(COMPULSORY)

Q.1. (i) Select the best option/answer and fill in the appropriate Box ■ on the **OMR Answer Sheet.(20x1=20)**
(ii) Answers given anywhere else, other than OMR Answer Sheet, will not be considered.

1. Which of the following is suitable to show the pictograms:
(A) Circles (B) Dots (C) Pictures (D) None of these

2. Harmonic mean gives less weightage to:
(A) Small values (B) Large values (C) Negative values (D) None of these

3. Sum of squares of the deviations is minimum when observations are taken from:
(A) Mean (B) Median (C) Mode (D) None of these

4. The probability of the intersection of two mutually exclusive events is always:
(A) Zero (B) One (C) Infinity (D) None of these

5. A distribution for which the mode does not exist, called:
(A) *t*-distribution (B) *F*-distribution (C) Continuous rectangular distribution (D) None of these

6. A function of variates for estimating a parameter is called:
(A) An estimator (B) An estimate (C) A statistic (D) None of these

7. Double sampling is also called:
(A) Two-stage sampling (B) Two-phase sampling (C) Dual sampling (D) None of these

8. The maximum likelihood estimators are necessarily:
(A) Unbiased (B) Efficient (C) Sufficient (D) None of these

9. A variable which is used in contingency table to explain the response variable is known as:
(A) Explanatory variable (B) Random variable (C) Dummy variable (D) None of these

10. Most of the nonparametric methods utilize the measurements on:
(A) Interval scale (B) Ratio scale (C) Ordinal scale (D) None of these

11. The range of multiple correlation coefficient is:
(A) $-\infty$ to ∞ (B) – 1 to 0 (C) 0 to 1 (D) None of these

12. Another name of autocorrelation coefficient is:
(A) Spearman correlation (B) Serial correlation (C) Bi-serial correlation (D) None of these

13. Measures based on association usually deals with:
(A) Attributes (B) Quantitative factors (C) Random variables (D) None of these

14. The death of an infant within 28 days of birth is known as:
(A) Infant death (B) Neonatal death (C) Maternal death (D) None of these

15. Unemployment rates are similar to:
(A) Survival rates (B) Migration rates (C) Death rates (D) None of these

16. Fertility rates provide an adequate basis for:
(A) Population growth (B) Family planning (C) Infant mortality (D) None of these

17. Life table is also known as:
(A) Life expectancy table (B) Survival table (C) Mortality table (D) None of these

18. Local control is a device to maintain:
(A) Homogeneity among blocks (B) Homogeneity within blocks
(C) Heterogeneity among blocks Copper (D) None of these

19. Missing observations in completely randomized design is to be:
(A) Estimated (B) Deleted (C) Guessed (D) None of these

20. In Latin square design, number of rows, columns and treatments are:
(A) Always equal (B) Always different (C) Not necessarily equal (D) None of these

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PART-II

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

NOTE: (i) **Part-II** is to be attempted on the separate **Answer Book.**

(ii) Attempt **FOUR** questions in all by selecting **TWO** Questions each from **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) 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 question will not be considered.

(vii) **Use of Calculator is allowed.**

SECTION-A

Q. No. 2(a) Describe the hypergeometric probability distribution and prove that the sum of hypergeometric probabilities are one. **(10)**

(b) Ten vegetables cans, all the same size, have lost their labels. It is known that 5 contain tomatoes and 5 contain corn. If 5 are selected at random what is the probability that all contain tomatoes? What is the probability that 3 or more contain tomatoes. **(10)** **(20)**

Q. No. 3(a) How non-parametric tests differ from parametric tests? Give advantages and disadvantages of non-parametric test. **(10)**

(b) A sample of size 8 was chosen from a population as given below: 2.55, 4.62, 2.93, 2.46, 1.95, 4.55, 3.11 and 0.90. Using the "sign test" to test the hypothesis that the median of the population equals 2 and the alternative that it does not. Give a decision whether to accept or reject the hypothesis based on computation. **(10)** **(20)**

Q. No. 4(a) Describe skewness and kurtosis with examples. Give merits and demerits in each case. **(10)**

(b) In a certain distribution, the first four moments about the point 4 are -1.5, 17, -30 and 108. Calculate the coefficients of skewness and kurtosis and state whether the distribution is leptokurtic or platykurtic? **(10)** **(20)**

Q. No. 5(a) Differentiate between multiple and partial correlation coefficients with at least one real life example in each case. **(10)**

(b) If b_{ij} is the regression coefficient of X_i on X_j, then calculate the multiple correlation coefficient of X_2 with X_1 and X_3, where $b_{12}=0.75, b_{13}=0.58,$ $b_{21}=0.89, b_{23}=0.53, b_{31}=1.68,$ and $b_{32}=1.30.$ **(10)** **(20)**

SECTION-B

Q. No. 6(a) Differentiate between sampling and non-sampling errors. What methods would you suggest to control each type of error? **(10)**

(b) A population consists of 5 units: 4, 5, 7, 9, and 10. We draw a sample of size 3 from a population by using simple random sampling without replacement. Verify that **(10)** **(20)**

(i) $E(\bar{X})=\mu$ and (ii) $\sigma_{\bar{x}}^2=\frac{\sigma^2}{n}\left(\frac{N-n}{N-1}\right)$.

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Q. No. 7(a) Describe the completely randomized design, its model and analysis. What are its advantages and disadvantages? **(10)**

(b) The following table contains the body weights of calves at 8 weeks of age. There were 3 levels of feeding given to a random sample of 5 calves each. A completely randomized design was used. Obtain standard error of a feeding treatment mean for the data on body weights. **(10)** **(20)**

Level of feeding		
Subnormal	Normal	Supernormal
118	142	162
122	129	173
121	134	168
126	132	193
109	135	172

Q. No. 8(a) Describe the “death rate”, “birth rate” and “morbidity rate”. Give at least one real life example in each case. **(10)**

(b) Calculate the “crude death rate” and “standardized death rate” by using the direct method in the following table. **(10)** **(20)**

Age group	Standard population	No. of deaths in standard population	Local population	No. of deaths in local population
0-9	60	18	400	16
10-19	1000	5	1500	6
20-59	3000	24	2400	24
60 & above	400	20	700	21

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