FEDERAL PUBLIC SERVICE COMMISSION
COMPETITIVE EXAMINATION-2022 FOR RECRUITMENT
TO POSTS IN BS-17 UNDER THE FEDERAL GOVERNMENT

Roll Number

STATISTICS

TIME ALLOWED: THREE HOURS PART-I(MCQS): MAXIMUM 30 MINUTES	PART-I (MCQS) PART-II	MAXIMUM MARKS = 20 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.
 (viii) Use of statistical table is allowed.

PART-II
SECTION – A

Q. 2. (a) What can you say of the skewness in each of the following cases? (09)

 i) The median is 60 while the two quartiles are 40 and 80.

 ii) Mean = 140 and Mode = 140.

 The first three moments about 16 are respectively -0.35, 2.09 and -1.93.

 (b) Discuss the various measures or quantities by which the characteristics of frequency distributions are measured and compared. (06)

 (c) Differentiate between descriptive and inferential statistics. (05) (20)

Q. 3. The following data give information on the ages (in years) and the number of breakdowns during the past month for a sample of seven machines at a large company. (20)

Age	12	7	2	8	13	9	4
Number of breakdowns	10	5	1	4	12	7	2

 i) Taking age as independent variable and the number of breakdowns as a dependent variable what is your hypothesis about the sign of B in the regression line.
 ii) Compute SS_{xx}, SS_{yy}, and SS_{xy}.
 iii) Find the least squares regression line by choosing appropriate dependent and independent variables based on your answer in part i.
 iv) Calculate r and r^2 and explain what they mean.
 v) Predict the number of breakdowns for age equal to 10 years.
 vi) Compute the standard deviation of errors.
 vii) Construct a 90% confidence interval for B.
 viii) Test the hypothesis $H_0 : \beta = 0$ against $\beta \neq 0$.

Q. 4. (a) A company has 800 employees. Twenty percent of the employees have college degrees but half of these people are in non-management positions. Thirty percent of the non-degree people are in management positions. (10)

 i) How many managers does the company have?

 ii) What is the conditional probability of being a college graduate is a manager?

 iii) Find the probability of randomly selecting someone who is either a college graduate or a manager.

STATISTICS

(b) A soft drink machine is regulated so that it discharges an average of 200 milliliters per cup. If the amount of drink is normally distributed with a standard deviation equal to 15 millimeters. **(10) (20)**

    i) What is the probability that a cup contains between 191 and 209 milliliters?

    ii) How many cups will likely overflow if 230 milliliters cups are used for the next 1000 drinks?

    iii) Below what value do we get the smallest 25% of the drinks?

SECTION-B

Q. 5. (a) A study of time spent on housework found that men who are employed spend an average of 8.2 hours per week doing housework (Americans' Use of Time Project, University of Maryland, American Demographics, November 1998). Assume that the amount of time spend on housework per week by all employed men in the United States is normally distributed with a mean of 8.2 hours and a standard deviation of 2.1 hours. **(10)**

    i) What is the probability that a randomly selected employed man spends 9 or more hours per week on housework?

    ii) What is the probability that a randomly selected employed man spends 7 hours or less on housework per week?

(b) A population consists of $N = 6$ numbers 0, 1, 5, 6, 8 and 11. Draw all possible samples of size $n = 3$, without replacement, from the population and find the sample means. Construct the sampling distribution of sample means and verify that: **(10) (20)**

$$\mu_{\bar{x}} = \mu \quad \text{and} \quad Var(\hat{X}) = \frac{\sigma^2}{n}\left(\frac{N-n}{N-1}\right)$$

Q. 6. (a) A candidate for mayor in a large city believes that he appeals more of the women voters than the men voters. He hires the services of a poll-taking organization, and they find that 62 out of 100 women interviewed support the candidate, and 69 out of 150 men support him. Calculate 99% confidence interval for the difference between two proportions. **(10)**

(b) Explain the six steps of Tests of Hypothes **(10) (20)**

Q. 7. (a) Given the following ANOVA for a RCB design **(12)**

S.V	d.f.	SS	MS
Blocks	8	2.1074	
treatments	3	2.1006	
Error	24	2.6249	

    i) Complete the analysis; fill in the mean squares

    ii) Compute the standard error for a treatment and for the difference between two treatment means.

    iii) Treatment means are 1.464, 1.195, 1.325 and 1.662. What mean or means do you suspect might represent different population by applying LSD test.

(b) Define the relative efficiency. How would you calculate the relative efficiency of LS design relative to RCB design with rows as blocks? **(08) (20)**

Q.8. (a) Construct the following weighted aggregative price index numbers for 1990 and 1991 from the given data: **(12)**

    i) Laspeyres' index   **ii)** Paasche's index   **iii)** Fisher's "Ideal" index

Commodity	Prices (Rs. per 40 kg)			Quantities (tons)		
	1986 (base)	1990	1991	1986	1990	1991
A	64	75	80	270	276	290
B	40	45	41	124	118	144
C	18	21	20	130	121	137
D	58	68	56	185	267	355

(b) Describe the importance of vital statistics. Also state its uses and limitations. **(08) (20)**

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