FEDERAL PUBLIC SERVICE COMMISSION
COMPETITIVE EXAMINATION FOR RECRUITMENT TO POSTS IN BS-17 UNDER THE FEDERAL GOVERNMENT, 2015

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 FIVE** questions from **PART-II. 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.

PART-II

Q. No. 2. **(a)** Discuss probability and its significance in social, economic and political problems. **(05)**

(b) Sam is going to assemble a computer by himself. He has the choice of chips from three brands, a hard drive from five, memory from two, and an accessory bundle from six local stores. How many different ways can Sam order the parts? **(05)**

(c) According to a Consumer Digest (July/August, 1996), the probable location of a personal computer (PC) in the home is as follows: **(06)**

Adult Bedroom: 0.03
Child Bedroom: 0.15
Other bedroom: 0.14
Office or den: 0.40
Other rooms: 0.28

(i) What is the probability that a PC is in bedroom?
(ii) What is the probability that a PC is not in a bedroom?

Q. No. 3. **(a)** On average, 2 traffic accidents per month occur at a certain intersection. What is the probability that in any given month at this intersection? **(08**
(i) exactly 6 accidents will occur?
(ii) fewer than 4 accidents will occur?

(b) A soft-drink machine is regulated so that it discharges an average of 100 millilitres per cup. If the amount of drink is normally distributed with a standard deviation equal to 10 millilitres, **(08)**
(i) How many cups will probably overflow if 130-milliter cups are used for the next 1000 drinks?
(ii) Below what value do we get the smallest 30% of the drinks?

Q. No. 4. **(a)** Differentiate between the following: **(06)**
(i) Null and Alternative hypothesis
(ii) One and two sided tests
(iii) Rejection and Acceptance region

(b) The variable X, is the carbon monoxide concentration in air, and ten measurements are obtained as follows: **(10)**
10.25, 10.37, 10.66, 10.47, 10.56, 10.22, 10.44, 10.38, 10.63, 10.40 mg/m^3.
(i) Test whether the mean concentration of carbon monoxide in air is 10.00 mg/m^3.
(ii) Calculate the power of the above test if the mean concentration of carbon monoxide in alternative hypothesis is assumed to be 10.75mg/m^3.

STATISTICS

Q. No. 5. **(a)** How do you test the equality of variances of two normal populations? **(04)**

(b) Differentiate between simple and composite hypothesis. **(04)**

(c) Given the statistics of two samples drawn from two normal populations $N(\alpha_1, \sigma^2)$ *and* $N(\alpha_2, \sigma^2{}_2)$ as, **(08)**

$$n_1 = 6, \qquad \bar{x}_1 = 25, \qquad s_1^2 = 36$$

$$n_2 = 8, \qquad \bar{x}_2 = 20, \qquad s_2^2 = 25$$

Test $H_0 : \alpha_1 = \alpha_2$ *vs* $\alpha_1 \neq \alpha_2$ under two situations (i) $\sigma_1^2 = \sigma_2^2$ (ii) $\sigma_1^2 \neq \sigma_2^2$

Q. No. 6. **(a)** How can the parameters β_0 and β_1 be estimated in simple linear regression model? **(04)**

(b) Delineate the properties of regression coefficients. **(04)**

(c) The following measurements show the respective height in inches of ten fathers and their eldest sons. **(08)**

Father(X):	67	63	66	71	69	65	62	70	61	72
Son(Y):	68	66	65	70	69	67	64	71	60	63

(i) Find the regression line of son's height on father's height.
(ii) Estimate the height of son for the given height of father as 70 inches.

Q. No. 7. **(a)** Discuss the properties of correlation coefficient. **(06)**

(b) Suppose that an advertising campaign for a new product is conducted in 10 test cities. The intensity of the advertising *x*, measured as the number of exposures per evening of prime-time television, is varied across cities; the awareness percentage y is found by survey after the ad campaign: **(10)**

x:	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5
y:	10.1	10.3	10.4	21.7	36.7	51.5	67.0	68.5	68.2	69.3

(i) Calculate and interpret the correlation coefficient r_{yx}
(ii) Does the relation appear linear you? Does it appear to be increasing?

Q. No. 8. **(a)** What is the need of sampling as compared to complete enumeration? **(04)**

(b) Highlight the advantages of stratified random sampling. **(04)**

(c) For a population with elements 5, 7, 8, 10, 13, draw all possible samples of size 3 without replacement and compute the sampling distribution of the sample means. **(08)**

Q. No. 9. Write note on any FOUR of the following: **(04 each)** **(16)**

(a) Applications of Poisson distribution

(b) Role of Statistics in social, law and economics

(c) Statistical importance of Normal distribution

(d) Conditional expectation

(e) Maximum likelihood estimation of the mean of a normal population

(f) Applications of *t*-distribution

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