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FEDERAL PUBLIC SERVICE COMMISSION

COMPETITIVE EXAMINATION FOR RECRUITMENT TO POSTS IN BPS-17, UNDER THE FEDERAL GOVERNMENT, 2004

STATISTICS

TIME ALLOWED: 3 HOURS **MAXIMUM MARKS:** 100

NOTE: Attempt **FIVE** questions in all, including **QUESTION NO. 8** which is **COMPULSORY**. All question carry equal marks.

1. a) Explain the association between randomness and probability. (5)

b) Give the limitations of classical and relative frequency definitions of probability. (5)

c) Can two mutually exclusive events be independent? Give your answer with proof. (5)

d) If A, B, and C are mutually independent events then show that
$P(A + B + C) = 1 - P(A')P(B')P(C')$ (5)

2. a) A survey is being conducted to determine the public opinion concerning the construction of a dam to control flooding in the ABC Valley. Fifteen residents of the area are to be randomly selected and surveyed. If, in fact, 80% of the people living in the area oppose the dam, what is the probability that a majority of those surveyed will be in the favour of the dam? (10)

b) Show that mean , median and mode, all have the same value for Normal distribution. Also give the applications of Normal distributions. (10)

3. a) Suppose, we want to compare the mean protein intake of all people with income below the poverty level to that of all people with incomes above the poverty level. The data given below, display the protein intakes, in grams, of a 24-hours period for independent random sample of 10 people with income below the poverty level and 8 people with income above the poverty level. Test, at 5% level of significance, whether the intake of rich people is higher than that of poor?

Below Poverty Level: **51.4, 76.7, 73.7, 66.2, 65.5, 49.7, 65.8, 62.1, 75.8, 62.0**

Above Poverty Level: **86.0, 59.7, 68.6, 98.6, 87.7, 69.0, 80.2, 78.1**

(10)

b) Explain the desirable properties of a good point estimator. (5)

c) What is power of a test? Also define confidence coefficient. (5)

4. a) Explain the coefficient of determination and write its interpretation. (5)

b) Explain, with example, the need of partial correlation. (5)

c) Test (at 10% level of significance) whether there is any correlation between X_1 and X_2, where

X_1:	12	16	18	18	25	23	23	30	45	47
X_2:	7	10	18	12	15	13	22	25	20	35

X_1= Additive oil (in gallons), X_2 = Mileage (in ,000 miles) (10)

5. a) Explain the general procedures to take a stratified and systematic samples. (10)

b) What is the difference between; (5)

(i) precision & reliability

(ii) stratum & cluster

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c) Differentiate between sampling plan and sampling frame. Also write a situation of investigation where there is no way other than taking a sample. (5)

6. a) How can you utilize the subject Statistics to evaluate the health problem of the community? (10)

b) What is the logic behind ANOVA for testing equality of several means? Also give the assumptions for ANOVA. Hence also mention that which test is used for overall fit of a regression model? (10)

7. Write short note on the following:

a) Baye's Theorem

b) Negative binomial distribution

c) Regression analysis

d) Disadvantages of sampling

(20)

COMPULSORY QUESTION

8. Write only the most appropriate option in your Answer Book, about the following statements. Do not reproduce the question. Cutting or overwriting is not allowed. (20)

(1) The standard deviation of a sample statistic is called
- a) Sampling bias
- b) Standard error
- c) Sampling error
- d) Sample deviation of statistic

(2) Which one of the following sample allocation procedure can be used when no information other than the total number of units in the stratum is given
- a) Equal allocation
- b) Proportional allocation
- c) Neyman allocation
- d) Optimum allocation

(3) In Poisson distribution
- a) mean > variance
- b) mean< variance
- c) mean= variance
- d) mean ≤ variance

(4) Binomial distribution approaches to Poisson when
- a) n is very large
- b) np remains constant
- c) p is very small
- d) all a,b, & c

(5) In regression analysis, the scatter of data about fitted line is measured by
- a) standard deviation
- b) with the help of slope
- c) with the help of intercept
- d) standard error of estimate

(6) In a positive skewed distribution
- a) mean = median = mode
- b) mean < median < mode
- c) mean > median > mode
- d) none of these

(7) In testing of hypotheses, which of the following statement is always true for α & β
- a) $\alpha + \beta = 1$
- b) $\alpha + \beta \neq 1$
- c) $\alpha > \beta$
- d) $\alpha < \beta$

(8) Testing of hypotheses is a phase to check the validity of
- a) population parameter
- b) sample estimate
- c) population
- d) all a,b, & c