(20)

FEDERAL PUBLIC SERVICE COMMISSION
COMPETITIVE EXAMINATION FOR RECRUITMENT TO POSTS IN BPS-17, UNDER THE FEDERAL GOVERNMENT, 2005

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) Write the applications of probability theory in decision making. (10)

   b) A study of credit card fraud was conducted by a crime researcher. According to collected data, it was found that 243 cases were of stolen cards, 85 of counterfeit card, 52 of mail orders and 46 of both stolen card and mail orders. Find the probability that a randomly selected case
   (i) belongs to counterfeit card
   (ii) belongs to stolen card or mail order fraud (10)

2. a) According to the Labour Department, 15% of adult workers have a vocational diploma but they did not attend any institution. If 8 adults are randomly selected find the probability that
   (i) at least half of them have diploma but they did not attend any institution.
   (ii) there is no such case that the adult has diploma but he did not attend any institution. (10)

   b) The serum cholesterol levels in men aged 18-24 are normally distributed with a mean of 178.1 and a standard deviation of 40.7 (all units are in mg/100ml). If a man aged 21 is selected at random, find the probability that his serum cholesterol level is between 100 and 200. Find the probability that for a sample of 10 men aged 21-24 will have average serum cholesterol level greater than 200. (10)

3. a) Differentiate between
   (i) One-tailed test and two-tailed test
   (ii) Interval and point estimation
   (iii) Simple and composite hypotheses (10)

   b) In an insurance study of pedestrian deaths in a country, monthly fatalities are analyzed for two different time periods. Sample data from the both time periods are summarized by the following statistics:

   $n_1 = 12,\ \bar{x}_1 = 46.42,\ s_1 = 11.07; \qquad n_2 = 15,\ \bar{x}_2 = 51.06,\ s_2 = 10.39$

   At 0.05 level of significance, test the claim that both time periods have the same mean. (10)

4. a) What is the difference between a correlation problem and a regression problem? Also give the situation where we have to use partial correlation rather than simple correlation. (10)

   b) Randomly selected subjects ride a bicycle at 5.5mi/h for one minute. Their weights (in pounds) are given with the number of calories used. Find the correlation coefficient between the both quantities.

Weights:	167	191	112	129	140	173	119
Calories used:	4.23	4.69	3.21	3.47	3.72	4.45	3.36

   (10)

5. a) Where do we use Stratified Random Sampling? Write a general procedure to draw a stratified random sample. Also differentiate between stratum and cluster. (10)

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b) What do you understand by sampling distribution? For a population of with elements 2, 4, 6, 8, 10, draw all possible random sample of size 2 without replacement and compute sample means. (10)

6. a) What are the applications of Statistics in daily life problems? (10)

b) A drug supplying pharmaceutical company is administered to 3 patients, and the random variable X represents the number of cures that occur. The probabilities corresponding to 0 cures, 1 cure, 2 cures, and 3 cures are found to be 0.125, 0.375, 0.375 and 0.125 respectively. Find the expected value of X and its variance. (10)

7. Write short note on the following: (20)

a) Poisson distribution

b) ANOVA

c) Coefficient of determination

d) Systematic sampling

COMPULSORY QUESTION

8. (A) 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. (10)

(1) Which of the following is NOT a measure of central tendency?
a) Median b) Mode
c) G.M d) Range

(2) A boarder security patrol that checks every passing vehicle, is using
a) Complete enumeration b) Simple random sampling
c) Systematic sampling d) Stratified sampling

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

(4) For regression line, Y = 2 – 5X
a) The Y-intercept is 2 b) The Y-intercept is -5
c) The slope of line is -5 d) both (a) & (c)

(5) Any set of outcomes of a random experiments is called
a) event b) sample points
c) random variable d) event space

(6) A complete program to take sample, is called
a) stratum size b) unit list
c) sampling frame d) sample design

(7) Which is NOT the property of a point estimator?
a) Unbiasedness b) Consistency
c) Accuracy d) Sufficiency

(8) If one event is unaffected by the outcome of another event, the two events are said to be
a) Independent b) Mutually exclusive
c) Dependent d) All (a), (b), & (c)

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(9) With a lower level of significance, the probability of rejecting a true null hypothesis
a) Remains same b) Increases
c) Decreases d) None of these

(10) To test of goodness of fit, we use
a) Chi-Square test b) t-test
c) F-test d) Z-test

(B) Write "T" for "True" or "F" for "False" in your Answer Book, as the case may be about the following statements: (10)

(1) The coefficient of Kurtosis measures the spreadness of a distribution. (T/F)

(2) The index number for a base year is always zero. (T/F)

(3) The probability of type-I error is also referred as confidence coefficient. (T/F)

(4) Probability always deals with uncertainty. (T/F)

(5) Hypegeometric distribution has two parameters. (T/F)

(6) Equality of several variances can be tested by ANOVA. (T/F)

(7) Coefficient of determination can also be determined by squaring of correlation coefficient. (T/F)

(8) Poisson distribution has only one parameter that is variance. (T/F)

(9) Random variable is always a real-valued function. (T/F)

(10) In systematic sampling, sampling interval can be non-integer. (T/F)

(End)

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