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**KHYBER PAKHTOON KHWA, PUBLIC SERVICE COMMISSION
COMPETITIVE EXAMINATION FOR THE POSTS OF PROVINCIAL
MANAGEMENT SERVICE (BPS-17), 2016**

STATISTICS

Time Allowed: 3 Hours

Maximum Marks: 100

- NOTE:** (i) Attempt any **FIVE** questions in all. All the questions carry equal marks.
(ii) Statistical table may be provided on request.
(iii) The use of calculator is **ALLOWED**.

- Q-1** a) Write the applications of probability theory in decision making.
b) In a small city, two news papers ABC and XYZ are published. The circulation departments report that 22% of the city's households have a subscription to ABC while 35% subscribe to XYZ. A survey reveals that 6% of all households subscribe to both newspapers. What proportion of the households subscribe to at least one newspaper?
c) Explain the difference between mutually exclusive and independent Events, giving examples.

(07+07+06=20)

- Q-2** a) Three airlines A, B, and C serve for a city. Airline A has 50% of all the scheduled flights, B has 30%, and airline C has the remaining 20%. Their on-time rates are 80%, 65%, and 40% respectively. A plane has just left on time. What is the probability that it was airline B?
b) If a random variable X presents a profit (in Pak Rupees) on selling an item then according to the following distribution of X , find the mean and variance of X :

$x:$	500	300	200	100
$P(X=x)$	1/6	2/6	2/6	1/6

(10+10=20)

- Q-3** a) A study in a certain group of schools shows that $2/3$ of all the students of class three can do routine arithmetic computations without using any calculator. If a random sample of 5 students of class three is selected from that group of schools, find the probability that
(i) Exactly 3 students are able to do routine arithmetic computations without using any calculator.
(ii) at least one student will require a calculator
b) The time required (in minutes) to fit an electronic component on a circuit board is approximately distributed as normal distribution with mean 12.9 and variance 4. What are the probabilities that fitting of such component will take time

- (i) at least 11.5 minutes?
(ii) between 11.0 to 14.5 minutes?

(10+10=20)

- Q-4** a) Differentiate between
(i) Null hypothesis and alternative hypothesis
(ii) Type-I and Type-II errors

(P.T.O)

b) In a time-use study, 10 randomly selected managers were found to spend a mean of 2.4 hours each day on paperwork with standard deviation 1.3 hours. Construct a 95% confidence interval for the mean time spent on paperwork by all the managers.

c) In a study of distances (in thousand miles) traveled by buses before the first major engine failure, a sample of 100 buses resulted in a mean 96.7 and a standard deviation 37.5. Using 5% level of significance, test the manufacturer's claim that mean distance traveled before a major engine failure is more than 90. (05+05+10=20)

Q-5 a) In an insurance study of worker's deaths in a heavy mechanical complex of a country, monthly fatalities are analyzed for two different time periods. Sample data from the both time periods are summarized by the following statistics:

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

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

b) A teacher proposes a course designed to increase reading speed and comprehension. To evaluate the effectiveness of this score, the teacher tests the students before and after the course. The scores of students before and after the said course are as under:

Before Course:	70,	60,	55,	65,	62,	52,	48,	64
After Course:	75,	85,	59,	65,	71,	55,	62,	71

Do the data provide sufficient evidence to conclude that the proposed course is effective to improve reading skills and comprehension? (Use 5% level of significance.) (08+12=20)

Q-6 a) 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

b) For the following data of Annual Expenditure(in Rs. Millions, X) for R & D and Annual Profit (in Rs. Millions, Y) of firm, estimate the regression equation.

Y:	31	40	34	30	25	20
X:	5	11	5	4	3	2

(10+10=20)

- Q-7 a) What are the uses of sampling in daily life?
- b) What are the main considerations while drawing a sample?
- c) Differentiate between random and non-random sampling, giving examples.
- d) Explain how a sample, using systematic random sampling, is drawn.

- Q-8 Write note on any FOUR of the following
- a) Applications of Statistics in Criminology and Political Problems
 - b) Marginal and conditional distributions
 - c) Applications of the Poisson distribution
 - d) Analysis of Variance (ANOVA)
 - e) Partial and multiple correlation
 - f) Cluster Sampling