FEDERAL PUBLIC SERVICE COMMISSION

COMPETITIVE EXAMINATION FOR RECRUITMENT TO POSTS IN BS-17 UNDER THE FEDERAL GOVERNMENT, 2012

Roll Number

STATISTICS

TIME ALLOWED:	**(PART-I MCQs)**	**30 MINUTES**	**MAXIMUM MARKS: 20**
THREE HOURS	**(PART-II)**	**2 HOURS & 30 MINUTES**	**MAXIMUM MARKS: 80**

NOTE: **(i)** Candidate must write **Q.No.** in the **Answer Book** in accordance with **Q.No.** in the **Q.Paper**.
(ii) Attempt **ONLY Five** questions from **PART-II**. All questions carry **EQUAL** marks.
(iii) Extra attempt of any question or any part of the attempted question will not be considered.
(iv) Use of Scientific calculator is allowed.

PART-II

Q.2. A candy company distribute boxes of chocolates with a mixture of creams, toffees and nuts coated in both light and dark chocolate. For a randomly selected box, let X and Y, respectively, be the proportion of the light and dark chocolates that are creams and suppose that the joint density function is:

$$f(x,y) = 2/3\,(2x + 3y), \qquad 0 \le x \le 1, \quad 0 \le y \le 1 \text{ and } 0 \text{ e.w.}$$

(a) Verify that join integration with respect to x and y is one. **(05)**

(b) Let 'A' is defined as the region $\{(x,y) \mid 0 \le x \le 1/2,\ 0 \le y \le 1/4\}$. Find $P[(X,Y)\ \mathcal{E}\ A]$ **(06)**

(c) Fin g(x) and h(y) **(05)**

Q.3. **(a)** In how many ways can 8 people be lined up get on bus? **(04)**

(b) If three specific persons insist on following each other? **(04)**

(c) If two specific person refuse to follow each other? **(04)**

(d) If 4 persons are male and 4 are females, in how many ways they can line up? **(04)**

Q.4. Determine if the use of z-test or t-test is appropriate, giving reason, for the following hypothesis. Also find the critical region for the test.

(a) n=19, σ is unknown and the population distribution is normal, left tail test α =0.05 **(04)**

(b) n=11, σ is known and the population distribution is normal, right tail test α =0.01 **(04)**

(c) n=56, σ is unknown, two tail test α =0.10 **(04)**

(d) n=12, σ is unknown and the population distribution is normal, left tail test α =0.05 **(04)**

Q.5. **(a)** Show that the sample mean $\overline{X}$ of random sample of size 'n' from a distribution having p.d.f. $f(x;\theta)=(1/\theta)\, e^{-(x/\theta)}$, $0 < x < \infty$, $0 < \theta < \infty$, zero elsewhere, is unbiased estimator of θ^2/n. **(10)**

(b) Let $X_1, X_2, \ldots\ldots, X_n$ be a random sample from a Bernoulli distribution. Find the maximum likelihood estimator of probability of success. **(06)**

Q.6. **(a)** For the following 2x2 table compute Chi-square value for test of independence: **(10)**

Attribute A	Attribute B	
	+	-
+	n_{++}	n_{+-}
-	n_{-+}	n_{--}

(b) A die is tossed 180 times with the following results: **(06)**

x	1	2	3	4	5	6
f	28	36	36	30	27	23

Is this a balanced die? Use 0.05 level of significance.

Q.7. (a) Describe and explain the "Principal of Least Square". Also obtain the least square estimates of slope and y-intercept of simple linear regression model. **(08)**

(b) The following are 15 readings of traffic volume (X cars/ hour) and carbon monoxide concentration (PPM) taken at a metropolitan air quality sampling sight:

X	**100**	**110**	**125**	**150**	**175**	**190**	**200**	**225**	**250**	**275**	**300**	**325**	**350**	**375**	**400**
Y	**8.8**	**9.5**	**10**	**10.5**	**10.5**	**10.5**	**10.6**	**11**	**12.1**	**12.1**	**12.5**	**13**	**13.2**	**14**	**14.5**

Fit a linear Regression model of Y on X. Also plot error vs X. **(08)**

Q.8. (a) Describe the situation where one way ANOVA can be applied. Also state the relevant hypotheses. **(06)**

(b) Researchers wish to know if the two populations differ with respect to the mean value of total serum complement activity (C_{H50}). Samples of size $n_1=10$ and $n_2=20$ are taken from diseased and normal subjects. The sample means and standard deviations are: **(10)**

$\bar{x}_1=62.6$ $s_1=33.8$ $\bar{x}_2=47.2$ $s_2=10.1$

Using appropriate test give your opinion on what the researchers wish.

Q.9. Writer short notes on any FOUR of the following: **(4 X 4=16)**

(i) Difference between simple and partial correlation.

(ii) Multiple regression

(iii) Use of statistics in electoral politics.

(iv) Test for equality two variance

(v) Joint probability distribution.

(vi) Mathematical expectation.

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