

# FEDERAL PUBLIC SERVICE COMMISSION



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

Roll Number

QuickJobs.pk

### STATISTICS

<b>TIME ALLOWED:</b>	<b>(PART-I MCQs) 30 MINUTES</b>	<b>MAXIMUM MARKS: 20</b>
<b>THREE HOURS</b>	<b>(PART-II) 2 HOURS &amp; 30 MINUTES</b>	<b>MAXIMUM MARKS: 80</b>

**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:

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

- (a) Verify that join integration with respect to x and y is one. (05)
- (b) Let 'A' is defined as the region  $\{(x,y) \mid 0 \leq x \leq 1/2, 0 \leq y \leq 1/4\}$ . Find  $P[(X,Y) \in A]$  (06)
- (c) Find 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)  $n=19$ ,  $\sigma$  is unknown and the population distribution is normal, left tail test  $\alpha =0.05$  (04)
- (b)  $n=11$ ,  $\sigma$  is known and the population distribution is normal, right tail test  $\alpha =0.01$  (04)
- (c)  $n=56$ ,  $\sigma$  is unknown, two tail test  $\alpha =0.10$  (04)
- (d)  $n=12$ ,  $\sigma$  is unknown and the population distribution is normal, left tail test  $\alpha =0.05$  (04)

**Q.5.** (a) Show that the sample mean  $\bar{X}$  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  $\theta^2/n$ . (10)

(b) Let  $X_1, X_2, \dots, X_n$  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 <sub>++</sub>	n <sub>+-</sub>
-	n <sub>-+</sub>	n <sub>--</sub>

**STATISTICS**

- (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)

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

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

- Q.9.** Write 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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