FEDERAL PUBLIC SERVICE COMMISSION

SECTION OFFICERS PROMOTIONAL EXAMINATION - 2017

BASIC MATHEMATICS & STATISTICS

Roll Number

TIME ALLOWED: THREE HOURS	**MAXIMUM MARKS = 100**

NOTE: (i) Attempt **FIVE** questions in all by selecting at least **TWO** questions from **EACH SECTION**. **Q. No. 4** requires use of **GRAPH PAPER**. **ALL** questions carry **EQUAL** Marks.

(ii) All the parts (if any) of each Question must be attempted at one place instead of at different places.

(iii) Candidate must write **Q. No.** in the **Answer Book** in accordance with **Q. No.** in the **Q. Paper**.

(iv) No Page/Space be left blank between the answers. All the blank pages of Answer Book must be crossed.

(v) Extra attempt of any question or any part of the attempted question will not be considered.

(vi) Leave some blank space and draw two horizontal lines (======) at the end of each answer.

(vii) USE OF CALCULATOR IS ALLOWED.

SECTION-A

Q. No. 1. (a) Simplify the trigonometric expression. (10)

$$\frac{\sin\alpha}{(1+\cos\alpha)} + \frac{(1+\cos\alpha)}{\sin\alpha}$$

Using the identity $\cos^2\alpha + \sin^2\alpha = 1$

(b) What is the result of simplify the following expression: (10) **(20)**

$$\frac{2^4 + (16 - 3\times 4) \div 4 + 3}{(6 + 3^2) \div (7 - 4)}$$

Q. No. 2. (a) Find $\frac{dy}{dx}$ where $y = \frac{x^2+1}{5x-3}$ (10)

(b) Solve the following set of linear equations by using inverse of a matrix method. (10) **(20)**

$$x - 3y = -1$$
$$4x + 3y = 11$$

Q. No. 3. (a) Find the square roots of the following equation: (10)

$$x^2 - 10x - 75 = 0$$

(b) Using binomial method, find the value of (10) **(20)**

$$\left(1 + \frac{5}{100}\right)^4$$

Correct to four decimal places.

Q. No. 4. (a) In how many different ways can the letters of the word 'OPTICAL' be arranged so that the vowels always come together? (10)

(b) Using graphical technique, find the solution of following equations: (10) **(20)**

$$y = 0.5x + 2$$
$$y = x - 2$$

You have to show on the graph the coordinates of the intersecting point.

SECTION-B

Q. No. 5. (a) A sociologist selected 300 students at random from each of the two schools and asked each student how many siblings he or she had. The results are shown in the table below: (10)

Number of siblings	City school	Beaconhouse school
0	50	75
1	80	80
2	45	20
3	100	40
4	25	85

(i) What is the median and mode number of siblings for City school?
(ii) What is the median and mode number of siblings for Beaconhouse school?
(iii) What is the overall median and mode number of siblings for the survey?

(b) In a town, 45% of all households have a pet and 35% have children. 40% of all households with children have a pet. A household is chosen at random. Find the probabilities of a, b and c. (10) **(20)**
(i) Having no children but a pet.
(ii) Having neither children nor a pet.
(iv) Having children, but no pet.

Q. No. 6. (a) In a certain hospital, records show that 75% of the patients suffering from dengue fever die. (10)
Using binomial distribution find the probability that out of 6 randomly selected patients, 4 will recover.

(b) What is a Chi-Square Test and what are its two type? Write down its formula and explain it. (10) **(20)**

Q. No. 7. (a) How do you define simple regression and what are the key terms in the regression equation? (10)
$Y = \alpha + \beta X + e$

(b) The values of x and their corresponding values of y are shown in the table below: (10) **(20)**

x	0	1	2	3	4
y	2	3	5	4	6

(i) Find the regression line:
$y = \alpha + \beta x$
(ii) Estimate the value of y when x = 10.

Q. No. 8. (a) In a school the students were asked to select one out of the five games. 136 liked badminton, 180 liked basketball, 84 liked hockey, 212 liked soccer and 108 liked table-tennis. (10)
You have to represent this data using a pie chart and show angle of each sector.

(b) 72 college students were asked to select a place they would like to visit in holidays. The table shows the result. (10) **(20)**

Place	Swat	Kaghan	Murree	Chitral	Sakardu
Number of students	15	24	19	9	5

Use a bar graph to represent this data.

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