PAPER: Elementary Mathematics-I (Algebra)   TIME ALLOWED: 2 hrs. & 30 mins.
Course Code: MTH-12107 / MATH-111   MAX. MARKS: 50

Attempt this Paper on Separate Answer Sheet provided.

Q.2   Answer the short questions (10x2=20)

i)   Give an example of two irrational numbers whose sum is rational number.

ii)   Separate into real and imaginary parts $\frac{2+9i}{5-2i}$.

iii)   If $\begin{vmatrix} k+2 & 1 \\ -5 & k-2 \end{vmatrix} = 0$, then find the value of k?

iv)   Analyze the roots of the quadratic equation $7x^2 - 2x + 5 = 0$

v)   Insert three geometric means between 1 and 81.

vi)   Find the 9th term of the sequence $1, \sqrt{2}, 2, \dots$?

vii)   Solve the equation $2x^2 - 5x + 10 = 0$

viii)   Find x and y, if $\begin{bmatrix} 3x+y & -y \\ 2y-x & 3 \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ -5 & 3 \end{bmatrix}$?

ix)   Find $f(x)$, given that $f(x-1) = x^2 + 3x + 5$?

x)   Find the sum of the series $6 + 12 + 18 + \dots + 150$?

Long Questions (5x6=30)

Attempt all questions.

Q.3   Prove the proposition P that the sum of first n positive integers is $n(n+1)/2$ using mathematical induction.

Q.4   For what value of m the equation $mx^2 + mx + 1 = -4x^2 - x$ has equal roots?

Q.5   Prove the identity $\frac{1}{\tan x + \cot x} = \frac{\sin 2x}{2}$.

Q.6   Find the cube roots of unity?

Q.7   Using the Cramer's Rule, solve the following system of equations

$$3x + y + z = 3$$
$$2x + 2y + 5z = -1$$
$$x - 3y - 4z = 2$$

PAPER: Elementary Mathematics-I (Algebra)
Course Code: MATH-111 / MTH-12107

TIME ALLOWED: 2 hrs. & 30 mins.
MAX. MARKS: 50

Attempt this Paper on Separate Answer Sheet provided.

Q.2   Answer the short questions: (2 × 10 = 20)

  (i)   Suppose time is measured in years and zero stands for the year 2000. What number stands for the year 1998?

  (ii)   On the birthday of Zohaib, a cake was equally distributed among 5 family members. What part of the cake was obtained by each family member?

  (iii)   Separate into real and imaginary parts $\dfrac{5-2i}{2+9i}$.

  (iv)   If $4x+3 = 2x-7$, find x.

  (v)   Find $f(x)$ given that $f(5x) = \dfrac{x}{x^2+1}$

  (vi)   Evaluate $\begin{vmatrix} 7 & 8 \\ 2 & 1 \end{vmatrix}$.

  (vii)   Solve the quadratic equation $2x^2 - 7x + 5 = 0$.

  (viii)   Using synthetic division, find the quotient and remainder when $3x^4 - 2x^3 + x - 5$ is divided by $x+1$.

  (ix)   Find the first four terms of the following arithmetic sequences $a_n = 2n+3$.

  (x)   Find θ when $l = 7$ cm, $r = 7$ cm.

Subjective Questions   (6 × 5 = 30)

Q.3   The product of two consecutive odd integers is 99. Find the integers.

Q.4   There are 42 students in a class. Of these, 22 study Statistics, 17 study Physics and 15 study neither Statistics nor Physics. By drawing a Venn diagram, find the number of students who study both Statistics and Physics.

Q.5   Show that roots of $ax^2 + (a+b)x + b = 0$ are real for all values of a and b.

Q.6   Find the sum of the geometric series $3 + 3^2 + 3^3 + \ldots + 3^n$.

Q.7   If x is so small that its cube and higher powers may be neglected, then show that

$$\frac{1}{(1+2x)(1-5x)} = 1 + 3x + 19x^2.$$

Q.8   If $\cot\theta = \sqrt{7}$ and the terminal side of the angle θ is not in the III quadrant, show that

$$\frac{\csc^2\theta + \sec^2\theta}{\csc^2\theta - \sec^2\theta} = \frac{4}{3}$$

PAPER: Elementary Mathematics-I (Algebra)   **TIME ALLOWED: 2 hrs. & 30 mins.**
Course Code: MATH-111 /   **MAX. MARKS: 50**

Attempt this Paper on Separate Answer Sheet provided.

Q.2   Answer the short questions (10x2=20)

(i)   If $z_1 = 3 - i$, evaluate $Re(-3z_1)$.

(ii)   Find $g(x)$ given that $g(x + h) = 7(x + h)^2 + 8(x + h) + 5$.

(iii)   Determine x if $\begin{vmatrix} 5 & 2x & 0 \\ 1 & x & 4 \\ -1 & 3 & 1 \end{vmatrix} = -10$.

(iv)   For what values of m the equation $3mx^2 = 4(mx - 1)$ will have equal roots?

(v)   Solve the quadratic equation $3x^2 - 17x - 20 = 0$.

(vi)   Find the nth term of the sequence $\left(\dfrac{5}{4}\right)^2, \left(\dfrac{9}{4}\right)^2, \left(\dfrac{13}{4}\right)^2, \ldots$

(vii)   Find the expansion of $(x - 5y)^5$.

(vii)   Prove that $\dfrac{\cos\theta + \sin\theta}{\cos\theta - \sin\theta} = \dfrac{\cot\theta + 1}{\cot\theta - 1}$.

(ix)   Find the area of a sector with central angle of 0.25 radian in a circular region whose radius is 2 m.

(x)   Bilal wants to cover the floor of wash room measuring 6 ft by 10 ft with square tiles of the same size. Given that he uses only whole tiles, find the largest possible length of the side of each tile.

(P.T.O.)

Long Questions (6x5=30)

Attempt all questions.

Q.3 The result of an examination of 50 students in two subjects is shown below:

Subject	Pass	Fail
Chemistry	37	13
Biology	33	17

If 9 were failed in both subjects. How many were passed in both subjects?

Q.4 Use Cramer's rule to find the solution of system of equations:

$$2x - y + z = 1$$
$$3x + y - 5z = 8$$
$$4x + y + z = 5$$

Q.5 One pipe can fill a pool 1.25 times faster than a second pipe. When both pipes are opened, they fill the pool in five hours. How long would it take to fill the pool if only the slower pipe is used?

Q.6 Using mathematical induction, prove that

$$3 + 7 + 11 + \ldots + (4n - 1) = n(2n + 1)$$

Q.7 If $\sin\alpha\cos\beta = p$ and $\cos\alpha\sin\beta = q$, then find the value of $\sin(\alpha + \beta)\sin(\alpha - \beta)$ in terms of p and q.

Q.8 Prove that $(1 + \tan\alpha - \sec\alpha)(1 + \cot\alpha + \operatorname{cosec}\alpha) = 2$.

UNIVERSITY OF THE PUNJAB

Second Semester 2016
Examination: B.S. 4 Years Programme

Roll No. ....

PAPER: Elementary Mathematics-I (Algebra)
Course Code: MATH-111 / MTH-12107

TIME ALLOWED: 2 hrs. & 30 mins.
MAX. MARKS: 50

Attempt this Paper on Separate Answer Sheet provided.

Q.2 **Answer the short questions (10x2=20)**

  i) Find the first four terms of the following arithmetic sequences $a_n = 2^n - 3$.

  ii) If $\begin{vmatrix} k+2 & 1 \\ -5 & k-2 \end{vmatrix} = 0$, then find the value of k?

  iii) Find inverse of the matrix $\begin{bmatrix} 1 & -1 \\ 4 & 2 \end{bmatrix}$

  iv) Find the roots of $x^2 - 4x + 8 = 0$.

  v) Find the 11th term of the sequence $1, \sqrt{2}, 2, ...$?

  vi) Find x and y, if $\begin{bmatrix} 3x+y & -y \\ 2y-x & 3 \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ -5 & 3 \end{bmatrix}$?

  vii) Solve for x and y if $x - 2y = 3, 2x - 3y = -1$.

  viii) Separate into real and imaginary parts $\frac{-i}{5-2i}$.

  ix) Find the number of terms in an A.P in which $a_n = 30, d = 20, a_1 = 10$.

  x) Expand $(2x - y)^6$.

Long Questions (5x6=30)

Attempt all questions.

Q.3 Solve the equation $\frac{1}{x-1} + \frac{2}{x-2} = \frac{3}{x-3}$ $x \neq 1, 2, 3$.

Q.4 For what value of m the equation $mx^2 + mx + 1 = -4x^2 - x$ has equal roots?

Q.5 Reduce $\cos^4 \theta$ to an expression involving only the functions of multiples of θ, raised to the first power.

Q.6 The first term of an A.P is 5, the last term is 45 and the sum is 400. Find the number of terms, common difference and sum of these terms.

Q.7 Solve the system of equations

$$2x - y - z = 2,$$
$$x + y - 2Z = -4,$$
$$3x + 2y - z = 1.$$

UNIVERSITY OF THE PUNJAB

Second Semester - 2017
Examination: B.S. 4 Years Programme

PAPER: Elementary Mathematics-I (Algebra)	**TIME ALLOWED: 2 hrs. & 30 mins.**
Course Code: MATH-111 / MTH-12107	**MAX. MARKS: 50**

Attempt this Paper on Separate Answer Sheet provided.

Q.2   Answer the following short questions.   [20]

i.   If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, then show that $A^2 - 5A - 2I = 0$.

ii. Solve the equation $2x^2 + 7x + 5 = 0$.

iii. Find the domain and range of the function $f(x) = \sqrt{3x - x^2}$.

iv. Find the multiplicative inverse of $\frac{7}{i-5}$.

v.   Solve $\frac{\sin 45^0}{\cos 45^0 + \tan 45^0}$

vi. Which term of the sequence $\frac{5}{2}, \frac{3}{2}, \frac{1}{2}, \cdots$ is $-\frac{105}{2}$?

vii. If $\begin{vmatrix} k+4 & 5 \\ -1 & k-2 \end{vmatrix} = 0$, then find the value\s of k.

viii. Find four A.Ms between -9 and 1.

ix. Solve $\sin(x + 30^0)\ \sin(x - 30^0)$.

x.   Expand $(x - 2y)^6$.

Answer the long questions.

Q. 3   Prove that the sum of the first n odd numbers is n^2.   [6]

Q.4   The sum of three numbers in A.P is 27 and their product is 585. Find the numbers.

[6]

Q. 5   Solve $\frac{9}{x+4} + \frac{3}{x-4} = \frac{5}{x-8}$ [6]

Q.6   In a survey of 60 people, it was found that: [6]

25 read *Newsweek* magazine, 26 read *Time*, 26 read *Fortune*, 9 read both *Newsweek* and *Fortune*, 11 read both *Newsweek* and *Time*, 8 read both *Time* and *Fourtune* and 3 real all three magazines.

a) Find the number of people who read at least one of the three magazines.
b) Draw the Venn diagram, where N, T and F denote the set of people who read *Newsweek*, *Time* and *Fortune*, respectively.
c) Find the number of people who read exactly one magazine.

Q.7   Find the coefficient of x^3 in the expansion of $\left(x - \frac{2}{x^2}\right)^{12}$.   [6]

UNIVERSITY OF THE PUNJAB

Second Semester - 2018
Examination: B.S. 4 Years Programme

Roll No. ....

PAPER: Elementary Mathematics-I (Algebra)
Course Code: MATH-111 / MTH-12107 **Part – II**

TIME ALLOWED: 2 Hrs. & 45 Mints.
MAX. MARKS: 50

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Attempt this Paper on Separate Answer Sheet provided.

Q.2 **Answer the following short questions.** **(10x2=20)**

  i.   If $\sec\theta = 2$ and the terminal side of the angle is not in the 1ˢᵗ quadrant, then find the remaining trigonometric values.

  ii. If the matrix $\begin{bmatrix} k & 2 \\ 5 & 5 \end{bmatrix}$ is singular, find the value of k?

  iii. The roots of $x^2 + kx + 9 = 0$ are equal. Find k?

  iv. Find the nth term of the sequence $5, x, 2x - 5, \ldots$.

  v.   Solve the equation $\frac{3}{2}(2x + 1) = \frac{1}{3}$.

  vi. Express $\frac{1}{2}\cos\theta + \frac{\sqrt{3}}{2}\sin\theta$ as single trigonometric ratio.

  vii. Simplify $\frac{3-2i}{1+5i}$.

  viii. Write two consecutive integers whose sum is 41.

  ix. Solve $2x^2 + 7x + 5 = 0$.

  x.   How many terms of an A.P: $7 + 5 + 3 + \ldots$, are required to make a sum of -825?

Answer the long questions.

Q. 3 Find the coefficient of x^3 in the expansion of $\left(x - \frac{2}{3x^2}\right)^{12}$. [6]

Q.4 Find the values of x and y, if [6]

$$\begin{bmatrix} x - 1 & 1 \\ 1 & y + 5 \end{bmatrix} + \frac{1}{2}\begin{bmatrix} -3 & -1 \\ 2 & 3y \end{bmatrix} = \begin{bmatrix} y & 0 \\ 2 & -x \end{bmatrix}$$

Q. 5 Solve the equation $x^{1/3} - x^{1/6} - 6 = 0$. [6]

Q.6 Find the cube roots of 8. [6]

Q.7 Solve the system of equations by Cramer's rule [6]

$$2x + y + z = 1,$$
$$3x + y - 5z = 8,$$
$$4x - y + z = 5.$$

UNIVERSITY OF THE PUNJAB

B.S. 4 Years Program / Second Semester – 2019

Paper: Elementary Mathematics-I (Algebra)
Course Code: MATH-111 / MTH-12107   Part – I (Compulsory)

Roll No. ....

Time: 2 Hrs. 30 Min.   Marks: 50

ATTEMPT THIS (SUBJECTIVE) ON THE SEPARATE ANSWER SHEET PROVIDED

Q.2.   Short Questions.   (10x2=20)

1. Define complex number

2. Factorize $9a^2 + 16b^2$

3. Find the inverse of the relation and check whether it is a function of not by diagram

$$\{(1,2),(2,5),(3,4),(2,1),(5,4)\}$$

4. Define function with example.

5. If $A = \begin{bmatrix} i & 0 \\ 1 & -i \end{bmatrix}$ show that $A^4 = I_2$

6. The sum of a positive number and its square is 380. Find the number.

7. By remainder theorem find remainder when $x^2 + 3x + 7$ is divided by $x + 1$.

8. If 5 and 8 are two arithmetic means between a and b. Find a & b.

9. If $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are in G.P then show that common ratio $= \pm\sqrt{\frac{a}{c}}$

10. Prove that $\sin^2\theta + \cos^2\theta = 1$

Q.3.   Long Questions.   (3x10=30)

1. Solve by Cramer rule

$$2x - 3y + 4z = -12, \quad x - 2y + z = -5, \quad 3x + y + 2z = 1$$

2. a). Solve: $4^{1+x} + 4^{1-x} = 10$

   b). If $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are in A.P then show that common difference $= \frac{a-c}{2ac}$

3. a) Expand the following upto 4 times, taking the values of x such that the expansion is valid $(2 - 3x)^{-2}$

   b). Prove that : $\sin^2\frac{\pi}{6} + \sin^2\frac{\pi}{3} + \sin^2\frac{\pi}{4} = 2$