

MOTITHANG HIGHER SECONDARY SCHOOL

MID-TERM EXAMINATION – 2017

MATHEMATICS

(Three Hours and a Quarter)

*(The first 15 minutes of the examination are for reading the paper only.*

*Candidates must NOT start writing during this time).*

Class XI SCIENCE

Total marks: 100

---

Answer Question 1 from Section A and 10 Questions from Section B.

The intended marks for questions or parts of questions are given in brackets [ ].

*Mathematical formulae are given at the end of this question paper.*

*The use of calculator (Fx-82)/ (Fx-100) is allowed.*

---

SECTION A

(Answer ALL questions)

**Directions:** Read the following questions carefully. For each question there are four alternatives A, B, C and D. Choose the correct alternative and write it in your answer sheet.

Question 1

(15x 2 = 30)

i) The nth term of GP is given by

- A)  $ar^n$                       B)  $a + (n - 1)d$                       C)  $a(n - 1)d$                       D)  $ar^{n-1}$

ii) The value of  ${}^{15}C_3$  is

- A) 444                      B) 456                      C) 455                      D) 453

iii) If  $x^3 + ax + 2a - 2$  is exactly divisible by  $x + 1$ . The value of a is

- A) 3                      B) 5                      C) 4                      D) 2

iv) The roots of the quadratic equation is  $x^2 - 4x - 1 = 0$  are

- A)  $\frac{4 \pm \sqrt{5}}{2}$                       B)  $\frac{2 \pm \sqrt{5}}{2}$                       C)  $\frac{4 \pm \sqrt{20}}{2}$                       D)  $\frac{2 \pm \sqrt{5}}{2}$

v) If  $\log_5 m = 3$ . The value of m is

- A) 125                      B) 135                      C) 124                      D) 154

- vi) Rational fraction in which degree of numerator is less than degree of denominator is called  
 A) proper fraction    B) mixed fraction    C) improper fraction    D) partial fraction
- vii) the value of  $\frac{\log_{40} 1000}{\log_{40} 100}$  is  
 A)  $\frac{3}{2}$                       B)  $\frac{2}{3}$                       C)  $\frac{4}{3}$                       D)  $\frac{3}{4}$
- viii) If  ${}^n C_{10} = {}^n C_{12}$ , determine the value of n and hence  ${}^n C_5$   
 A) 22, 26334                      B) 21,26335    C) 23,23665    D) 25, 26336
- ix) The arithmetic mean of marks of obtained by 10 students of class X in Mathematics in a certain examinations is 30. The marks obtained are 25, 30, 21, 55, 47, 10, 15, x, 45,35. The value of ' x ' is  
 A) 300                      B) 17                      C) 283+x                      D) 30
- x) The value of  $\log_{\sqrt{2}} 16$  is  
 A) 2                      B) 8                      C) 4                      D) 16
- xi) The number of factors for the polynomial  $7x^3 + 2x + 5 = 0$  is  
 A) 3                      B) 2                      C) 4                      D) 1
- xii) Two roots for  $\frac{(x-3)(x+7)}{x^2+1} = 0$  are  
 A) 1, 3                      B) 3, 7                      C) 3, -7                      D) 1, 7
- xiii) The sum of 20 terms of 4,8,12,16..... is  
 A) 760    B) 840    C) 84    D) 76
- xiv) The value of  ${}^{10}C_8$  is  
 A) 45                      B)55                      C)57                      D) 43
- xv) The 7<sup>th</sup> term of 2,4,8.....is  
 A) 123                      B)125                      C)120                      D)128

**Section – B (70 marks)**

**Answer any 10 questions**

**Question 2**

- a) The second term of G.P is 2 and the sum of infinite terms is 8. Find the first term. [3]
- b) Expand  $(x + \frac{1}{x})^6$   $x \neq 0$  [4]

**Question 3**

- a) Find the value of [3]
- i)  $5^{\log_5 2 + \log_5 3}$
- ii)  $\log_2(\log_2 4)$
- b) Resolve  $\frac{x^2+2}{(x+1)^2}$  into partial fractions. [4]

**Question 4**

- a) Find the remainder when  $x^3 - 7x + 4$  is divided by  $x - 1, x + 2$  [3]
- b) Solve  $\frac{x+1}{x-1} - \frac{x-1}{x+1} = \frac{5}{6}$  [4]

**Question 5**

- a) Factorize
- i)  $x^2 + 4xi - 4 = 0$  [4]
- ii)  $15x^2 - 28 = x$
- b) Let A and B be the remainders when the polynomial  $y^3 + 2y^2 - 5ay - 7$  and  $y^3 + ay^2 - 12y + 16$  are divided by  $y - 1$  and  $y + 2$  respectively. If  $2A+B=0$ , find the value of a [3]

### Question 6

a) The sum of three numbers in AP is 33 and the sum of their square is 461. Find the numbers [3]

b) Resolve into partial fraction  $\frac{2x^2+1}{2x^2+3x+1}$  [4]

### Question 7

a) Resolve into partial fraction  $\frac{11+x}{(2-x)(x-3)}$  [3]

b) Solve [4]

i)  $\sqrt{3}x^2 - \sqrt{2}x + 3\sqrt{3} = 0$

ii)  $ix^2 + 4x - 5i = 0$

### Question 8

a) If  $\log_{10} x^2 - \log_{10} \sqrt{y} = 1$ , find the value of y when  $x=5$  [3]

b) Graph the expression  $x^2 + x - 6$  and find the roots of the equation [4]

### Question 9

a) Resolve into partial fraction  $\frac{42-19x}{(x^2+1)(x-4)}$  [3]

b) Find the value of 0.234 regarding it as a geometric series [4]

### Question 10

a) Given that  $x - 2$  and  $x + 1$  are factors of  $x^3 + 3x^2 + ax + b$ , calculate the values of a and b. [3]

b)  $\log \frac{(a+b)}{2} = \frac{1}{2}(\log a + \log b)$  show that  $a=b$  [4]

**Question 11**

a) Resolve into partial fraction  $\frac{10x^2+9x-7}{(x+2)(x^2-1)}$  [3]

b) i) Find the value of K when  $x^3 + 3x^2 - kx + 4$  is divided by  $x - 2$

ii) Find the remainder of  $3x^2 + 8x^2 - 6x + 1$  when divided by  $x + 3$  [4]

**Question 12**

a) If the polynomial  $ax^3 + 4x^2 + 3x - 4$  and  $x^3 - 4x - a$  leaves the same remainder when divided by  $x-2$ , find the value of a [3]

b) The fourth term of an AP is equal to 3 times the first term, and the seventh term exceeds twice the third by 1. Find the first term and common difference. [4]

**Question 13**

a) evaluate  $0.9\bar{7}$  [3]

b) Prove that  $\frac{\log_a n}{\log_{ab} n} = 1 + \log_a b$ . [4]

**Question 14**

a) solve for x ;  $\log_{27}(\log_3 x) = \frac{1}{3}$  [3]

b) Decompose  $\frac{2x+1}{(x^2+2)(x^2+3)}$  into partial fraction [4]

**Mathematics Formulae**

**Algebra**

$$a^2 - b^2 = (a + b)(a - b)$$

$$(a \pm b)^2 = a^2 \pm 2ab + b^2$$

$$n_{C_r} = \frac{n!}{r!(n-r)!}$$

In the quadratic equation  $ax^2 + bx + c = 0$ ,  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$