

MARTHOMA RESIDENTIAL SCHOOL, TIRUVALLA  
SECOND TERMINAL EXAMINATION

Class: XI

MATHEMATICS

Time: 3 Hrs

Marks: 80

Section A (Answer All Questions)

Question 1

- I. Evaluate  $(3 + \sqrt{2})^5 - (3 - \sqrt{2})^5$
- II. If the sum of the first two terms of a G.P is -4 and the fifth term is 4 times the third term. Find the G.P.
- III. If the vertices of a triangle are  $(1, k)$ ,  $(4, -3)$  and  $(-9, 7)$  and its area is  $15 \text{ cm}^2$ . Find  $k$ .
- IV. Find the value of  $k$  for which the line  $(k - 3)x - (4 - k^2)y + k^2 - 7k + 6 = 0$  is parallel to Y-axis?
- V. Find the value of  $m$  for which the coefficient of  $x^2$  in the expansion of  $(1 + x)^m$  is 6.  
(5 × 2)

Question 2

- I. If  $a, b, c$  are in A.P,  $b, c, d$  are in G.P and  $\frac{1}{c}, \frac{1}{d}, \frac{1}{e}$  are in A.P. Prove that  $a, c, e$  are in G.P.
- II. If the three consecutive vertices of a parallelogram are  $(-2, -1)$ ,  $(1, 0)$  and  $(4, 3)$ . Find the 4<sup>th</sup> vertex.  
(3 × 2)

Question 3

- I. Reduce the equation  $3x - 2y + 4 = 0$  into intercept form. Find i) the slope ii) x and y intercepts iii) length of the segment intercepted between axes.
- II. Find  $k$  so that the term independent of  $x$  in the expansion of  $(\sqrt{x} - \frac{k}{x^2})^{10}$  is 405.  
(3 × 2)

Question 4

- I. The sum of first 3 terms of a G.P is 16, and the sum of next three terms is 128. Find first term, common ratio and  $S_n$ .
- II. Find the locus of a point which moves such that the ratio of its distance from the origin and the point  $A(-2, 5)$  is 2:3  
(3 × 2)

Question 5

- I. In a triangle ABC,  $A(2, 3)$ ,  $B(4, -1)$  and  $C(-1, 2)$ . Find the equation and length of altitude from the vertex A.

11. The sum of the coefficients of first three terms in the expansion of  $(x - \frac{3}{x})^n$ ,  $n \in \mathbb{N}$  is 599. Find the term containing  $x^3$ ?

**Question 6**

- I. Find the sum of  $n$  terms of the series  $1+4+9+16+\dots$
- II. Find the bisector of the acute angle between the lines  $2x+y=4$ ,  $3x-y+5=0$ .

**Section B (Answer All Questions)**

**Question 1**

- a. Find  $\lim_{x \rightarrow \infty} \frac{(x+1)(2x+3)}{(x+2)(3x+4)}$
- b. How many numbers are there between 100 and 1000 such that every digit is even or 9.
- c. The probabilities of the occurrences of two  $E_1$  and  $E_2$  are 0.25 and 0.50 respectively. The probability of their simultaneous occurrence is 0.14. Find the probability that neither  $E_1$  nor  $E_2$  occurs.
- d. Evaluate  $\lim_{x \rightarrow 0} \frac{e^{kx}-1}{3x}$
- e. Find  $\frac{dy}{dx}$ ;  $y = (2x+3)^3(\sin x^2)$
- f. A book contains 100 pages. A page is chosen at random. What is the probability that the sum of the digits on the page is equal to 9.

**Question 2**

- a. How many permutations can be formed by the letters of the word "ILLUMINATION" when i) all vowels come together ii) all consonants come together.
- b. Find  $\lim_{x \rightarrow 1} f(x)$  where  $f(x) = \begin{cases} 5x-4 & \text{if } 0 < x \leq 1 \\ 4x^3-3x & \text{if } 1 < x < 2 \end{cases}$

**Question 3**

- a. Four cards are drawn from a well shuffled deck of cards. Find the probability that
  - i) there is one card from each suit
  - ii) there are two spades and two hearts
  - iii) there are at least 3 aces.
- b. Differentiate  $y = \frac{3x+4}{4x+3}$  and find the value of derivative at  $x=-2$ .

**Question 4**

- a. Determine  $n$  if  ${}^{2n}C_3 : {}^nC_3 = 11:1$ .
- b. Find the derivative of  $y = \cot x$  using quotient rule.

**Question 5**

- a. A committee of 5 is to be selected from among 6 boys and 5 girls. Determine the number of ways of selecting the committee if it is to consist of at least one boy and one girl.
- b. Find the derivative of  $y = \sqrt{3x-2}$  using first principle.

**Question 6**

a. A box containing 25 tickets numbered 1 to 25. Two tickets are drawn at random. What is the probability that the product of numbers is even.

b. Find  $\lim_{x \rightarrow \frac{\pi}{2}} \frac{1 + \cos 2x}{(\pi - 2x)^2}$ .

(3 × 2)