

MART HOMA RESIDENTIAL SCHOOL TIRUVALLA
THIRD TERM EXAMINATION 2018-19

CLASS:11

MATHEMATICS

MAXMARK:100

(Three hours)

(Candidates are allowed additional 15 minutes for only reading the paper. They must NOT start writing during this time.)

The Question Paper consists of three sections A, B and C. Candidates are required to attempt all questions from Section A and all questions EITHER from Section B OR Section C

Section A: Internal choice has been provided in three questions of four marks each and two questions of six marks each. Section B: Internal choice has been provided in two questions of four marks each. Section C: Internal choice has been provided in two questions of four marks each. All working, including rough work, should be done on the same sheet as, and adjacent to the rest of the answer.

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

SECTION-A (80Marks)

Question 1

[10× 2]

- i. If $A = \{x: x \in W, x < 2\}$ $B = \{x: x \in N, 1 < x < 5\}$ and $C = \{3, 5\}$, find $A \times (B \cap C)$
- ii. Let $R = \{(x, y): y = x + 1, x \in W \text{ and } y \in \{0, 1, 2, 3, 4, 5\}\}$
 - a) List the elements of R
 - b) Represent R in an arrow diagram
- iii. Show that $\cos 10^\circ + \cos 110^\circ + \cos 130^\circ = 0$.
- iv. If A, B, C are the angles of a triangle ABC and if $\cos A = \frac{\sin B}{2 \sin C}$, show that the triangle is isosceles.
- v. Find the real values of x and y if $(x + y) - (3x + 2y)i = 5 + 2i$
- vi. Find the value of k for which the roots α, β of the equation $x^2 - 6x + k = 0$ satisfies the relation $2\alpha + 3\beta = 20$.
- vii. In how many ways can 10 books be arranged on a shelf if a) 5 particular books must always be together? b) 2 particular books must occupy the first position and the last position?
- viii. Find the derivative of $\frac{x^2 + 1}{x - 1}$ with respect to x.
- ix. Evaluate $\lim_{x \rightarrow 2} \frac{x^2 - 5x + 6}{x^2 - 7x + 10}$.
- x. A box contains 5 white, 4 red, and 6 black balls. A ball is drawn at random from the box. Find the probability that the ball drawn is i) either white or black ii) neither red nor white.

Question 2

Find the domain and range of the function $f(x) = \sqrt{9 - x^2}$, $x \in \mathbb{R}$.

[4]

Question 3

a. Find the value of $\sin 2\theta$, $\cos 2\theta$ and $\tan 2\theta$ given $\tan \theta = -\frac{1}{5}$, θ in Quadrant II.

[4]

OR

b. Prove that $\frac{\sin \theta + \sin 2\theta}{1 + \cos \theta + \cos 2\theta} = \tan \theta$.

Question 4

Using mathematical induction, prove that $3^{2n+2} - 8n - 9$ is divisible by 8 for all $n \in \mathbb{N}$.

[4]

Question 5

If $z = x + iy$ and $\left| \frac{z-2}{z-3} \right| = 2$. Show that $3(x^2 + y^2) - 20x + 32 = 0$.

[4]

Question 6

- a. i How many different numbers of six digits can be formed with the digits 3,1,7,0,9,5
ii) How many of them are divisible by 10?
iii) How many of them will have zero in the ten's place?

[4]

OR

- b. A committee of 6 members has to be formed from 8 boys and 5 girls. In how many ways can this be done if the committee consists of
(i) exactly 3 girls
(ii) at least 3 girls.

Question 7

Find the coefficient of x^{15} and the term independent of x in the expansion of $(x^2 + \frac{2}{x})^{15}$. Also find the ratio between them.

[4]

QUESTION 8

Find the equation of a straight line which passes through the point (3,4) and has intercepts on the axes such that their sum is 14.

[4]

QUESTION 9

- a. Find the length of the chord intercepted by the circle $x^2 + y^2 = 25$ on the line $2x - y + 5 = 0$.

[4]

OR

- b. Find the equation of a circle which passes through (1,0) and (0,1) and having its centre on the line $x + y = 1$

Question 10

Differentiate the function $y = \sec x$ with respect to x by First Principle of differentiation. [4]

Question 11

If $\tan x, \tan y, \tan z$ are in GP, show that $\cos 2y = \frac{\cos(x+y)}{\cos(x-z)}$ [6]

Question 12

- a. For what values of m the roots of the equation $x^2 - 2x(1+3m) + 7(3+2m) = 0$ will be equal. Also find the roots? [6]

OR

- b. If α and β are the roots of the equation $ax^2 + bx + c = 0$. Form an equation whose roots are $(1 + \alpha^2)$ and $(1 + \beta^2)$.

Question 13

- a. Find 3 numbers in GP whose sum is 21 and the third term exceeds the first term by 9. [4]

- b. Find S_∞ for the series $1, \frac{1}{3}, \frac{1}{9}, \dots$ [2]

OR

- c. Find the sum to n terms of the series $1 \times 2^2 + 2 \times 3^2 + 3 \times 4^2 + \dots$ [6]

Question 14

Find the mean and standard deviation for the following data [6]

Class	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70
frequency	2	3	5	10	3	5	2

Section-B (20 marks)

Question 15

- [3x]
- If the parabola $y^2 = 4px$, passes through $(3, -2)$. Find the length of latus rectum and co-ordinates of focus?
 - Find the equation of the parabola whose focus at $(6, 0)$ and directrix $x = -6$
 - Find the eccentricity of the ellipse $36x^2 + 4y^2 = 144$.

Question 16

- Find the equation of the ellipse with centre at the origin, major axis is on the X axis and whose eccentricity is $\sqrt{\frac{2}{5}}$ and passes through $(-3, 1)$.
- OR
- Find the equation of the hyperbola whose foci are $(4, 1)$ and $(8, 1)$ and whose eccentricity is 2.

Question 17

- Find the points on the x axis which are at a distance of $5\sqrt{2}$ units from the point $(2, -3, 5)$.
- OR
- Find the ratio in which the line segment joining the points $(2, 4, -3)$ and $(-3, 5, 4)$ is divided by the XY- plane.

Question 18

Find the equation of the tangent to the parabola $y^2 + 12x = 0$, from the point $(3, 8)$.

SECTION-C (20 Marks)

Question 19

- The correlation coefficient between X and Y is 0.64. Their co-variance is 16. The variance of X is 9. Find the standard deviation of Y series?
- Find by Simple Aggregate method, the index number from the following data.

Commodity	Base Price	Current Price
Rice	30	35
Wheat	22	25
Fish	54	64
Potato	20	25
Coat	15	18

Question 20

[4]

- a. Calculate Karl Pearson's coefficient of correlation between X and Y for the following data

X	16	18	21	20	22	26	27	15
Y	22	25	24	26	25	30	33	14

OR

- b. Marks obtained by 9 students in physics and maths are given below. Calculate Spearman's rank correlation coefficient.

Physics	35	23	47	17	10	43	9	6	28
Maths	30	33	45	23	8	49	12	4	31

Question 21

- a. The quotations for five different commodities for the year 2000 and 2005 are given below. Calculate the index number for 2005 with 2000 as the base year by using the weighted average price relative method.

Commodity	weights	Price in	
		2000	2005
A	5	2.00	4.50
B	7	2.50	3.20
C	6	3.00	4.50
D	2	1.00	1.80

Question 22

[6]

The number of letters in hundreds, posted in a certain city in each day for a week is given below.

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
35	70	36	59	62	60	71

Calculate the 3 day moving averages and represent them graphically.