

MAR THOMA RESIDENTIAL SCHOOL, TIRUVALLA

THIRD TERMINAL EXAMINATION 2017-18

CLASS: XI

MATHEMATICS

TIME: 3HRS

MAXMARKS:100

The question paper consists of 3 sections A,B,C. The candidates are required to attempt all the questions from Section A and all the questions from either from Section B or Section C

SECTION-A

1.

i. Determine the domain and range of the relation R

a. $R = \{(x, x^3) / x \text{ is a prime number less than } 10\}$

ii. Prove that $\frac{\sin(A-B)}{\cos A \cos B} = \tan A - \tan B$

iii. Find the 4th term in the expansion of $(\frac{x}{2} + \frac{1}{x})^6$ using binomial theorem.

iv. If the difference between the roots of the equation $x^2 + ax + 8 = 0$ is 2, find 'a'?

v. The nth term of a sequence is $4n^2 + 1$. Find the sequence?

vi. find the value of 'k' so that the line $(k-2)x + (k+3)y - 5 = 0$ is parallel to $2x - y - 7 = 0$

vii. Find the length of the tangent from (2,3) to the circle $x^2 + y^2 + 3x + 2y - 7 = 0$.

viii. Six coins were tossed simultaneously 1000 times and at each toss the number of heads were counted. The results were recorded as under:

No: of heads	6	5	4	3	2	1	0
No of tosses	20	25	160	283	338	140	34

Calculate mean for this distribution.

ix. Evaluate $\lim_{\theta \rightarrow 0} \frac{\sin \theta \cos \theta}{3\theta}$.

x. Differentiate $\frac{x^3}{3} - 2x^2 + 6x - 3$. (10 × 2)

i. If $\frac{1}{2!} + \frac{1}{4!} + \frac{1}{6!} = \frac{x}{6!}$, find x. (2)

ii. In a survey of 60 people, it was found that 25 people read newspaper H, 26 read newspaper I, 26 read newspaper J, 9 read both H and I, 11 read both H and J, 8 read both I and J, 3 read all three newspapers. Find i) the number of people who read at least one of the newspaper. ii) number of people who read exactly one newspaper. (4)

3.

I. Find the value of n such that $n-1P_3 : nP_4 = 1:9$ (2)

II. If $x + y = z$, prove that $\cos^2 x + \cos^2 y + \cos^2 z = 1 + 2 \cos x \cos y \cos z$ (4)

4.

- I. For the post of 5 teachers, there are 23 applicants. 2 posts were reserved for SC candidates and there are 7 SC candidates among the applicants. In how many ways can the selection be made? (2)
- II. If $f(x) = \frac{2}{9}x^4 - \frac{5}{3}x^3 + 2x - 1$, find $f^{-1}(x)$. Also find $f^{-1}(-3)$ (4)

5. If the coefficient of 2^{nd} , 3^{rd} and 4^{th} terms in the expansion of $(1+x)^n$ are in AP. Show that $n^2 - 9n + 14 = 0$. (6)
6. If the roots α and β of the equation $x^2 - px + 16 = 0$, satisfy the relation $\alpha^2 + \beta^2 = 9$, find p ? (6)
7. How many terms of the series $15 + 12 + 9 + \dots$ must be taken to make the sum 15? (6)
Also find the 10^{th} term in the series?
8. If the term independent of x in the expansion of $(\sqrt{x} - \frac{a}{x^2})^{10}$ is 405. Find 'a'? (6)
9. The sum of certain number of terms of a GP, whose 1^{st} term and common ratio are 5 and 2 respectively. Find T_n and number of terms? (4)
10. Show that the points (5,2) (1,-1) and (11,4) lie on a straight line?. Also find i) intercepts on the axes ii) slope of the line iii) length of the portion intercepted between the axes? (4)

OR

11. Find the equation of a circle which passes through (5,0) and (1,4) and whose centre lies on the line $x + y - 3 = 0$ (6)
12. Calculate the mean, variance and standard deviation for the following frequency distribution

Classes	0-10	10-20	20-30	30-40	40-50
frequency	5	8	15	16	6

- 13.i) Find the derivative of $(x^3 + \sin x)^4$ (6)

OR

- ii) Find the number of permutations of the letters of the word KAPIL. (a). beginning with K and ending with L (4)
- (b) P being always in the middle (c) vowels being always together. (4)
14. Given that $y = (3x-1)^2 + (2x-1)^3$. Find $\frac{dy}{dx}$ and the points on the curve for which $\frac{dy}{dx} = 0$ (4)

SECTION-B (16 marks)

15.

- a) Find the length of latus rectum and foci of the parabola $y^2 = 4ax$ which passes through (3,2) (2)
- And

- b) Find the equation of the ellipse whose minor axis is 10 and foci are $(\pm 6, 0)$ (2)

16. Find the coordinates of centre, vertices, foci, equation of axes, directrices, LR, and eccentricity of the ellipse $3x^2 + 4y^2 - 12x - 8y + 4 = 0$ (6)

17. a) Find the equation of the hyperbola whose focus (1, 2) directrix is $2x+y=1$ and eccentricity $\sqrt{3}$. (4)

AND

b) Find the eccentricity of the hyperbola $\frac{x^2}{9} - \frac{y^2}{7} = 1$ (2)

Section-C (16 marks)

18. The Price Index of a watch in 2012 relative to 2005 is 120. If the price of watch is Rs. 480 in 2012, find the price of watch in 2005? (1)

19. Find the coefficient of correlation between x and y when $\sum x_i = 50, \sum y_i = -30, \sum x_i^2 = 290, \sum y_i^2 = 300, \sum x_i y_i = -115$ and $n = 10$. (2)

20. Calculate the Index Number for the year 1979 with 1970 as base from the following data using weighted average of price relatives.

Commodity	Weight	Price	
		1970	1979
A	22	2.50	6.20
B	48	3.30	4.40
C	17	6.25	12.75
D	13	0.65	0.90

(6)

21. a. Find the Karl Pearson's coefficient of correlation between x and y for the following

x	16	18	21	20	22	26	27	15
y	22	25	24	26	25	30	33	14

OR

b. Calculate Spearman's coefficient of rank correlation from the following data and interpret the result

x	16	19	22	28	25	31	37	40	43	49
y	25	25	27	31	27	33	35	41	45	41

(6)

22. The profit's of a paper bag manufacturing company(in lakhs of rupees) during a year are

Month	Jan	Feb	march	April	may	June	July	August	Sep	Oct	Nov	Dec
Profit	1.2	0.8	1.4	1.6	2.0	2.4	3.6	4.8	3.4	1.8	0.8	1.2

Calculate the 4 monthly moving averages and plot on the graph sheet (3)