ཤེས་རིག་ལྷན་ཁག།

སྒྲིགས་བང་འཛིང་རིམ་སློབ་གྲྭ་གོང་མ།

MOTITHANG HIGHER SECONDARY SCHOOL

THIMPHU THROMDE

"Every child is **inspired** to learn and **empowered** with **wisdom** to excel in life"

TRIAL EXAMINATIONS, 2019

Mathematics **Reading Time: 15 mins**

Class XII Sci **Writing Time: 3 hours**

Date: **Full Marks: 100**

Name:…… Roll No. ……..Class:…… Sec:…….

Invigilator's initial

Grand Total

Questions	**For Teacher's Use Only**																									
	Section A	**Section B**																								
	Q1	**Q2**		**Q3**		**Q4**		**Q5**		**Q6**		**Q7**		**Q8**		**Q9**		**Q10**		**Q11**		**Q12**		**Q13**		**Q14**	
Marks	**30**	**3**	**4**	**3**	**4**	**4**	**3**	**5**	**2**	**4**	**3**	**3**	**4**	**3**	**4**	**5**	**2**	**3**	**4**	**3**	**4**	**3**	**4**	**3**	**4**	**5**	**2**
Award																											
Teacher's initial																											
Total Marks Awarded																											

READ THE FOLLOWING DIRECTIONS CAREFULLY:

1. *Do not write for the first **15 minutes**. This time is to be spent reading the questions.*
2. *After having read the questions, you will be given **3 hours** to answer all questions.*
3. *This paper comprises of **2 Sections**. Answer **Question 1** from Section **A** and **10 questions** from Section **B***
4. *All working, including rough work, should be done on the same sheet adjacent to the rest of the answer. The intended marks for questions or parts of questions are given in brackets [].*
5. *The use of calculator (fx-82/ fx-100) is allowed.*
6. *Remember to write quickly but neatly.*

SECTION A

(Answer **All** questions)

Direction: For each question, there are four alternatives: A, B, C and D. Choose the correct alternative and circle it. Do not circle more than ONE alternative. If there is more than one choice circled, NO score will be awarded.

Question 1 $[2\times15=30]$

i) How many diagonals are there in a polygon of 10 sides

A. 45 B. 35 C. 40 C. 50

ii) The principal value of $\tan^{-1}\left(-\frac{\sqrt{3}}{3}\right)$ is

$A.\ \frac{5\pi}{6}$ $B.\ -\frac{5\pi}{6}$ $C.\ \frac{\pi}{6}$ $D.\ -\frac{\pi}{6}$

iii) The derivative of $\sqrt{1+\sqrt{x}}$ is

$A.\ \frac{1}{4\sqrt{x+x\sqrt{x}}}$ $B.\ \frac{1}{4x\sqrt{1+\sqrt{x}}}$ $C.\ \frac{1}{4\sqrt{1+\sqrt{x}}}$ $D.\ \frac{1}{\sqrt{x+x\sqrt{x}}}$

iv) If the equation $12x^2-10xy+2y^2+11x-5y+k=0$represents a pair of lines, what is the value of k?

A. -2 B. 2 C. 1 D. –1

v) If $P(A)=0.7, P(B)=0.4\ and\ P(A/B)=0.3$, determine the probability that neither A nor Boccurs.

A. 0.98 B. 0.6 C. 0.05 D. 0.02

vi) What is the conjugate of $(2+i)^2$?

$A.\ 2-i$ $B.\ 4-3i$ $C.\ 3-4i$ $D.\ 3+4i$

vii) If $y=\frac{1}{4}x^4-\frac{2}{3}x^3+\frac{1}{2}x^2+\frac{11}{2}$, then at x=1 the function is having

A. Maximum B. Minimum C. Inflexion point D. intersection point

viii) What is the angle between the straight lines represented by $3x^2-y^2-\sqrt{3}x+3y-2=0$?

$A.\ 30°$ $B.\ 45°$ $C.\ 60°$ $D.\ 90°$

ix) In how many ways can the letters of the word MISSISSIPPI be arranged such that vowels are never together?

A. 34650 B. 840 C. 35490 D. 33810

x) $\int \frac{1}{e^x - 1} dx$ is

$A. 1 - e^{-x} + c$ $B. \log(1 - e^{-x}) + c$ $C. \log(e^x - 1) + c$ $D. \log(e^{-x} - 1) + c$

xi) Equation of an ellipse whose foci are $(-2, 4)$ *and* $(4, 4)$ and major axis is 10 is

$A. \frac{(x-1)^2}{16} + \frac{(y-4)^2}{25} = 1$ $B. \frac{(x-4)^2}{16} + \frac{(y-1)^2}{25} = 1$ $C. \frac{(x-4)^2}{25} + \frac{(y-1)^2}{16} = 1$ $D. \frac{(x-1)^2}{25} + \frac{(y-4)^2}{16} = 1$

xii) One bag contains three white and two black balls and another bag contains two white and four black balls. A bag and a ball are drawn at random. What is the probability that the ball is white?

$A. \frac{3}{10}$ $B. \frac{1}{6}$ $C. \frac{3}{60}$ $D. \frac{7}{15}$

xiii) What is the cofactor of the element in second row, third column of the determinant $\begin{vmatrix} 2 & 0 & -1 \\ -5 & 1 & 2 \\ -3 & 3 & 4 \end{vmatrix}$?

A. 6 B. – 6 C. 9 D. – 3

xiv) A and B are two events associated with the sample space of a random experiment where P(A)=0.2, P(AorB)=0.7, P(B)=p. The value of p for the events to be independent is equal to

$A. \frac{2}{7}$ $B. \frac{1}{2}$ $C. \frac{3}{7}$ $D. \frac{5}{8}$

xv) The value of z if $|z| + z = 2 + i$, where z is a complex number is

$A. \frac{3}{4} + i$ $B. \frac{3}{4} - i$ $C. \frac{1}{4} + i$ $D. \frac{1}{4} - i$

SECTION B (70 Marks)

Answer any 10 questions. All questions in this section have equal marks.

Question 2

i) If $\sin y = x\sin(a+y)$, *prove that* $\frac{dy}{dx} = \frac{\sin^2(a+y)}{\sin a}$ [3]

ii) Use matrix method to solve following system of equations. [4]

$x_1 + x_2 + x_3 = 6$

$x_1 - x_2 + x_3 = 2$

$2x_1 + x_2 - x_3 = 1$

Question 3

i) If $x^2+4xy+4y^2+5x+10y+4=0$ represents a pair of straight lines, then find the lines. [3]

ii) Solve the equation $\sin\left(\sin^{-1}\frac{1}{5}+\cos^{-1}x\right)=1$ [4]

Question 4

i) Find the center, foci, eccentricity and length of latus rectum of hyperbola

$$9x^2 - 16y^2 - 18x - 64y - 199 = 0$$ [4]

ii) The following table gives the record of heights of eight athletes and the measurements of their long jump and high jump to nearest cm. [3]

Athletes	Height	Long jump	High jump
1	158	324	175
2	165	365	185
3	162	380	180
4	170	400	184
5	175	350	200
6	163	350	172
7	178	425	188
8	164	375	180

Calculate coefficient of rank correlation between height and high jump. Comment on the result.

Question 5

i) If x, y, z are different and $\Delta = \begin{vmatrix} x & x^2 & 1+x^3 \\ y & y^2 & 1+y^3 \\ z & z^2 & 1+z^3 \end{vmatrix} = 0$, then show that 1+ xyz = 0. [5]

ii) Find the coordinates of the point which is three fifths of the way (3, 4, 5) to (-2, -1, 0). [2]

Question 6

i) Find the distance between the points (-1, -5, -10) and the point of intersection of the line $\frac{x-2}{3}=\frac{y+1}{4}=\frac{z-2}{12}$ with the plane $x-y+z=5$. [4]

ii) Evaluate the integral as limit of sums. [3]

$$\int_1^3 (x^2 + x)\, dx$$

Question 7

i) There are 10 candidates and 4 are to be selected. If a voter votes at least one candidate, in how many ways can a voter vote in an election, if a voter may vote for any number of candidates, not greater than the number to be elected? [3]

ii) Evaluate $\int x^2 \tan^{-1} x \, dx$ [4]

Question 8

i) Find the equation of a plane passing through the point (1, -1, -1) and perpendicular to each of the planes $x-2y-8z=0 \; and \; 2x+5y-z=0$ [3]

ii) Solve the differential equation [4]

$$(x+1)\frac{dy}{dx} - y = e^{3x}(x+1)^2$$

Question 9

i) Compute Karl Pearson's Correlation coefficient for the following data. [5]

x	1	2	3	4	5
y	3	1	2	5	4

Also, find the regression line y on x and find y when x=8.

ii) Find the equation of the angle bisector between the lines $x^2 - xy\sec^2\theta - y^2\tan^2\theta = 0$ [2]

Question 10

i) Prove that $\int_0^{\pi/2} \frac{3\sin\theta + 4\cos\theta}{\sin\theta + \cos\theta} d\theta = \frac{7\pi}{4}$ [3]

ii) There are four events A, B, C and D one of which must and only one can happen. The odds are 2:5 in favor of A, 3:4 in favor of B and 1:3 in favor of C. Find the odds against D. [4]

Question 11

i) The focus of a parabola is (2, 1) and the equation of directrix is $3x+2y+1=0$. Find the equation of a parabola. [3]

ii) If $y = a\cos(\log x) + b\sin(\log x)$, *prove that* $x^2 \frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = 0$ [4]

Question 12

i) Prove that $\tan^{-1}\frac{1}{4} + \tan^{-1}\frac{2}{9} = \frac{1}{2}\cos^{-1}\frac{3}{5}$ [3]

ii) The sum of three positive numbers is 26. The second number is thrice as large as the first. If the sum of the squares of these numbers is least, find the numbers. [4]

Question 13

i) Find the equation of the line passing through the point of intersection of the lines $x+y=9$ *and* $2x-3y=-7$ *and perpendicular to the line* $2y-3x-5=0$. [3]

ii) If z is a complex number such that $\left|\frac{z-5i}{z+5i}\right|=1$, then show that z is purely real. [4]

Question 14

i) a) Calculate the area of the region bounded by the curve $y = 2x - x^2$ and the line y=x.

b) The region bounded by the curve and the x-axis is rotated through four right angles about the x-axis. Calculate the volume of the solid of revolution so formed. [5]

ii) Find the modulus of the complex number $\frac{2+3i}{3+2i}$ [2]

Rough work