གཞས་རིག་སྦྱན་ཁག།

སྒྲིགས་ཐང་འཛིང་རིམས་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, 2020

Mathematics **Reading Time: 15 mins**

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

Date: **Full Marks: 100**

Name:…… Roll No. ……..Class:…… Sec:…….

Invigilator's initial

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**	**3**	**4**	**3**	**4**	**3**	**4**	**3**	**4**	**3**	**4**	**3**	**4**	**3**	**4**	**3**	**4**	**3**	**4**	**3**	**4**	**3**	**4**
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´ 15=30]

i) The value of $\begin{vmatrix} \tan^2\theta & \cos^2\theta & 0 \\ 0 & \sin\theta & \tan\theta \\ \tan\theta & 0 & \sin\theta \end{vmatrix}$

A. $\cos^2\theta$ *B.* $\sec^2\theta$ *C.* $\sec^2\theta - 1$ *D.* $\tan\theta$

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

A. $\frac{\pi}{6}$ *B.* $-\frac{\pi}{6}$ *C.* $\frac{\pi}{3}$ *D.* $-\frac{\pi}{3}$

iii) $\frac{d}{dx}\left(\frac{\sqrt{x+1}+\sqrt{x-1}}{\sqrt{x+1}-\sqrt{x-1}}\right)$ *is*

A. $\frac{x}{\sqrt{x^2-1}}$ *B.* $\frac{1}{\sqrt{x^2-1}}$ *C.* $1-\frac{x}{\sqrt{x^2-1}}$ *D.* $1+\frac{x}{\sqrt{x^2-1}}$

iv) The area of a triangle whose vertices are (-3, 5), (3, -6), (7, 2) is

A. 92 sq. units B. 46 sq. units C. 26 sq. units D. 22 sq. units

v) Equation of the bisectors of angles between pair of lines $2x^2 - 3xy + y^2 = 0$ *is*

A. $x^2 - 3xy + y^2 = 0$ *B.* $3x^2 + 2xy - 3y^2 = 0$ *C.* $2x^2 + xy - y^2 = 0$ *D.* $2x^2 + 2xy - 3y^2 = 0$

vi) $r = 0.6, \sigma_x = 1.5, \sigma_y = 2, \bar{x} = 10$ *and* $\bar{y} = 20,$ then the equation of regression line X on Y is

A. $y = 0.8x + 12$ *B.* $x = 0.8y + 10$ *C.* $x - 0.45y = 1$ *D.* $y + 0.45x - 1 = 0$

vii) If the probability of A, B, C, D solving a problem is $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{1}{5}$ respectively. What is the probability that the problem will be solved?

A. $\frac{19}{20}$ *B.* $\frac{1}{20}$ *C.* $\frac{19}{30}$ *D.* $\frac{29}{30}$

viii) What are the dc's of the line joining the points (2, -1, 3) and (4, 3, 0)?

A. $2, 4, -3$ *B.* $-2, -4, -3$ *C.* $\frac{2}{\sqrt{29}}, \frac{4}{\sqrt{29}}, \frac{-3}{\sqrt{29}}$ *D.* $\frac{-2}{\sqrt{29}}, \frac{4}{\sqrt{29}}, \frac{-3}{\sqrt{29}}$

ix) If $A = \begin{bmatrix} 3 & -2 \\ -4 & 5 \end{bmatrix}$, find the value of $(A')^2$.

A. $\begin{bmatrix} 17 & -32 \\ -16 & 33 \end{bmatrix}$ *B.* $\begin{bmatrix} 17 & -16 \\ -32 & 33 \end{bmatrix}$ *C.* $\begin{bmatrix} -16 & 17 \\ 33 & -32 \end{bmatrix}$ *D.* $\begin{bmatrix} -16 & -32 \\ 33 & 17 \end{bmatrix}$

x) If $\sin^{-1} x + \cos^{-1}\left(\frac{1}{2}\right) = \frac{\pi}{2}$, then x is

A. 0 *B.* $\frac{1}{2}$ *C.* $\frac{2}{\sqrt{5}}$ *D.* $\frac{\sqrt{3}}{2}$

xi) $\int \frac{\tan^{-1} x}{1+x^2}\,dx$ *is*

A. $\frac{(\tan^{-1} x)^2}{2} + c$ *B.* $(\tan^{-1} x)^2 + c$ *C.* $\tan^{-1} x + c$ *D.* $\frac{\tan^{-1} x}{2} + c$

xii) equation of a parabola whose focus is (1, -2) and vertex is at (3, -2) is

A. $y^2 + 4y - 4x + 4 = 0$ *B.* $y^2 - 4y + 4x - 4 = 0$ *C.* $y^2 - y + 3x + 2 = 0$ *D.* $y^2 + 4y + 8x - 24 = 0$

xiii) A card is drawn at random. What is the probability that the card drawn is neither a king nor a heart?

A. $\frac{2}{3}$ *B.* $\frac{4}{9}$ *C.* $\frac{7}{13}$ *D.* $\frac{9}{13}$

xiv) What is the eccentricity of the curve $4y^2 + 9x^2 = 36$?

A. $\frac{3}{\sqrt{5}}$ *B.* $\frac{\sqrt{5}}{3}$ *C.* $\sqrt{3}$ *D.* $\sqrt{5}$

xv) $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sin|x|\,dx$ *is*

A.0 B. 1 C. 2 D. 3

SECTION B (70 Marks)

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

Question 2

i) If $A = \begin{bmatrix} -4 & -3 & -3 \\ 1 & 0 & 1 \\ 4 & 4 & 3 \end{bmatrix}$, show that adjA=A [3]

ii) Find the vertex, focus, equation of directrix and length of LR of the parabola $y^2 - 4y - 4x + 16 = 0$. [4]

Question 3

i) Prove that $\sin\left[\cot^{-1}\left\{\cos\left(\tan^{-1}x\right)\right\}\right]=\sqrt{\frac{x^2+1}{x^2+2}}$ [3]

ii) The events A and B are such that $P\left(\overline{A}\right)=\frac{3}{4}, P\left(A/B\right)=\frac{1}{3}, P\left(A\cup B\right)=\frac{2}{3}$. *Find* [4]

a) $P(A)$ *b*) $P(A\cap B)$ *c*) $P(B)$ *d*) $P\left(A/\overline{B}\right)$

Determine whether A and B are independent.

Question 4

i) Find the equation of the plane passing through the point $(-1, 3, 2)$ and is perpendicular to the planes $x + 2y + 2z = 5$ *and* $3x + 2y + 2z = 8$. [3]

ii) The part of the curve $y = x^2 - 2x - 3$ which lies below the x-axis is rotated about that axis. Find the volume of the solid generated. [4]

Question 5

i) Given below is the height and weight of ten children. Find Spearman's rank correlation coefficient and interpret the result. [3]

Height(cm)	89	88	90	88	90	88	92	94	93	91
Weight(kg)	11	12	12	10	13	11	13	14	15	12

ii) *If* $y = e^{\tan^{-1}x}$, *show that* $\left(1+x^2\right)\frac{d^2y}{dx^2} + (2x - 1)\frac{dy}{dx} = 0.$ [4]

Question 6

i) Evaluate the integral of $\int x^2 (\log x)^2 \, dx$ [3]

ii) Find eccentricity, center, focus and length of axes of ellipse $16x^2 + 25y^2 - 32x - 200y + 16 = 0$. [4]

Question 7

i) Solve the system by using determinant [3]

$$x + 3y + 5z = 22$$
$$5x - 3y + 2z = 5$$
$$9x + 8y - 3z = 16$$

ii) Find the area enclosed between the curves $y^2 = 4ax$ *and* $x^2 = 4ay$, *where* $a > 0$ [4]

Question 8

i) Use matrix method to solve the system of equations [3]

$x + 5y = 3$

$2x + 10y = 6$

i) Marks obtained by 8 students in weekly test in English and Accountancy is given below. Fit a line of least square and estimate the score in Accountancy if the score in English is 12. [4]

English	12	4	6	3	9	10	18	14
Accountancy	10	5	6	4	10	9	15	8

Question 9

ii) The probability of Australia winning a test match against Zimbabwe is ½ . Assuming independent from match to match, what is the probability that in a 5 match series, Australia's 2nd win occurs at the 3rd test. [3]

ii) Find the value of $\int_0^{\rho} \frac{x \tan x}{\sec x + \tan x}\, dx$. [4]

Question 10

i) Solve the equation

$$\tan^{-1}(x+1)+\tan^{-1}(x-1)=\tan^{-1}\frac{8}{31}.$$ [3]

ii) Find the equation of the plane passing through the line of intersection of planes $x+2y+3z-5=0$ *and* $3x-2y-z+1=0$ and making equal intercepts on x-axis and y-axis. [4]

Question 11

i) Find the equation of the conic section whose focus is (1, -1), eccentricity is ½ and directrix is the line $x-y=3$. Is the conic section an ellipse? [3]

ii) Find two numbers whose sum is 15 and the square of one multiplied by the cube of the other is maximum. [4]

Question 12

i) Show that the equation $2x^2 - 10xy + 12y^2 + 5x - 16y - 3 = 0$ represents a pair of straight lines. [3]

ii) If $\log(x^2 + y^2) = 2\tan^{-1}\frac{y}{x}$, *show that* $\frac{dy}{dx} = \frac{x+y}{x-y}$. [4]

Question 13

i) Find the dc's of the line which is perpendicular to the lines with dc's proportional to 1, -2, -2 and 0, 2, 1. [3]

ii) If If $x = e^{q}\left(q + \frac{1}{q}\right)$ *and* $y = e^{-q}\left(q - \frac{1}{q}\right)$, *find* $\frac{dy}{dx}$ *at* $q = 0$ [4]

Question 14

i) Determine the area of the region of the function bounded by the curve y = 2sinx and the x-axis where $0 \pounds x \pounds p$. [3]

ii) Without expanding the determinant, show that [4]

$$\begin{vmatrix} x & y & z \\ x^2 & y^2 & z^2 \\ yz & zx & xy \end{vmatrix} = (x - y)(y - z)(z - x)(xy + yz + zx)$$