ཤེས་རིག་ལྷན་ཁག།

སྒུ་ཏི་གཁང་འཛིང་རིམ་སློབ་གྲྭ་ཚོང་མ།

MOTITHANG HIGHER SECONDARY SCHOOL
THIMPHU THROMDE
"Every child is **inspired** to learn and **empowered** with **wisdom** to excel in life"

MID TERM EXAMINATION 2019

Class: XII Commerce &Arts **Time : 3.15 Hours**

Subject : Business Mathematics **Full Marks : 100**

Name : …….. Class & Section : ……...Roll Number : …..

Invigilator's initial :

For Teacher's use only																	
Section A		**Section B**															
Question 1		**Q 2**		**Q 3**		**Q 4**		**Q 5**		**Q 6**		**Q 7**		**Q 8**		**Q 9**	
Marks	**30**	**a**	**b**	**a**	**b**	**a**	**b**	**a**	**b**	**a**	**b**	**a**	**b**	**a**	**b**	**a**	**b**
		3	**4**	**4**	**3**	**2**	**5**	**2**	**5**	**3**	**4**	**3**	**4**	**3**	**4**	**3**	**4**
Marks Awarded																	
Marker's initial																	
Section B		**Q 10**		**Q 11**		**Q 12**		**Q 13**		**Q 14**		**Total Marks A+B =**					
Marks	**70**	**a**	**b**	**a**	**b**	**a**	**b**	**a**	**b**	**a**	**b**						
		3	**4**	**3**	**4**	**2**	**5**	**3**	**4**	**3**	**4**						
Marks Awarded												**Chief Marker's initial :**					
Marker's initial																	

Answer **Question 1** from Section A and **10 questions from** Section **B**.
All working including rough work, should be done on the same sheet adjacent to rest of the answer.

The intended marks or parts of the questions are given on brackets [ ].
Mathematical formulae are given at the end of this question paper.
The use of calculator (Fx-82) (Fx-100) is allowed.

Direction: *Read the following questions carefully. For each of the questions, there are four alternatives A, B, C and choose the correct alternative and write it in the space provided.*

Question 1 $[2\times15=30]$

(i) IF ${}^{43}C_{r-6}={}^{43}C_{3r+1}$, then the value of r is:

A. 12
B. 8
C. 10
D. 6

Answer……..

(ii) If $(-8,-2)$, $(-4,a)$, $(-1,,5)$ are collinear then the value of a is :

A. 6
B. -6
C. 2
D. -2

Answer……

(iii) The Gradient of the curve $y=4x^7-3x^3+5x-11$ at the point $(1,-2)$ is:

A. 25
B. 23
C. 24
D. 22

Answer…….

(iv) If $A^2 - 5A - 14I = 0$, the A^{-1} is:

A. $\frac{1}{14}(5I - A)$

B. $\frac{1}{14}(A - 5I)$

C. $14(A - 5I)$

D. $14(5I - A)$

Answer…….

(v) Study the table.

Function	***Derivative***
x^2	$2x$
$1-x$	-1
$x^2 - 3x + 1$	$2x - 3$

What is the derivative of $\frac{1}{x^2}$?

A. $-2x$

B. $-\frac{1}{x}$

C. $-\frac{2}{x}$

D. $-\frac{2}{x^3}$

Answer…….

(vi) If the profit function of a company is given by given by $P(x) = \frac{1}{3}x^3 + \frac{5}{2}x^2 - 6x + 500$, then the company has maximum profit at:

A. $x = -1$

B. $x = -6$

C. $x = 1$

D. $x = 2$

Answer……

(vii) What is the value of x in the determinant $\begin{vmatrix} 0 & x & -1 \\ -1 & 8 & 3 \\ 0 & 5 & 1 \end{vmatrix} = 7$?

A. 7
B. -2
C. -1
D. -7

Answer…….

(viii) $\int (4-3x)^4 \, dx$ is equal to:

A. $\frac{1}{15}(4-3x)^5 + C$
B. $\frac{3}{5}(4-3x)^5 + C$
C. $-\frac{1}{15}(4-3x)^5 + C$
D. $-\frac{3}{5}(4-3x)^5 + C$

Answer……..

(ix) The numbers of ways of forming four digit numbers with the digits 2, 3, 5, 7 and 9 without repetition are:

A. 26
B. 60
C. 120
D. 210

Answer……..

(x) If $A = \begin{bmatrix} 1 & 2 & 5 \\ -1 & 4 & 1 \\ 1 & 3 & -1 \end{bmatrix}$, the co-factor of the element 3 is:

A. 18
B. -6
C. -18
D. -6

Answer……

(xi) Nala invited 20 of his friends for a dinner. In how many ways can Nala and his friend be seated around a circular table so that two particular friends be seated on either side of Nala?

A. 19!2! ways
B. 20!2! ways
C. 17!2! ways
D. 18!2! ways

Answer……

(xii) $\int \frac{x}{x^2+3} dx$ is:

A. $\frac{1}{2}\log(x^2+3)+C$
B. $\log(x^2+3)+C$
C. $2\log(x^2+3)+C$
D. $\frac{1}{3}\log(x^2+3)+C$

Answer……

(xiii) The function $x+\frac{27}{x^3}$ is minimum at x is equal:

A. 3
B. 4
C. 5
D. 27

Answer……

(xiv) In how many ways can letters of the word "MOTITHANG" be arranged:

A. 362880
B. 725760
C. 181440
D. 215322

Answer……

(xv) If $y = x^x$, find $\frac{dy}{dx}$

A. $2x$

B. $x \ x^{x-1}$

C. $x^x(1+\log x)$

D. $x^x(1-\log x)$

Answer……

SECTION B

Answer any 10 *questions. All questions in this equal marks.*
Unless otherwise stated, you may round off your answer to two decimal places.

$[7 \times 10 = 70]$

Question 2

(a) If $\sqrt{x} + \sqrt{y} = \sqrt{p}$, find $\frac{dy}{dx}$. [3]

(a) Using the properties of determinant express the $|A|$ in factor. [4]

$$|A = \begin{vmatrix} 1 & a & bc \\ 1 & b & ca \\ 1 & c & ab \end{vmatrix}$$

Question 3

(a) If $A = \begin{bmatrix} 1 & 0 & -1 \\ 3 & 4 & 5 \\ 0 & -6 & -7 \end{bmatrix}$, find $A(adjA)$ without finding $adjA$. [3]

(b) $\int \frac{1-x}{(x+1)(x^2-x-12)}dx$ [4]

Question 4

(a) How many committees of 5 members each can be formed with 8 officials and 4 non-officials members in following ways:

i. Each consist of 3 officials and 2 non-officials;

ii. Each consist of at least two non-officials. $[2 \times 2 = 4]$

(b) If $x = at^2$ and $y = 2t^3$ find $\frac{d^2y}{dx^2}$. $[3]$

Question 5

(a) If $x^m y^n = (x+y)^{m+n}$, prove that $\frac{dy}{dx} = \frac{y}{x}$ [4]

(b) If $A = \begin{bmatrix} 1 & 3 \\ 2 & -1 \end{bmatrix}$, Find A^{-1} and show that $AA^{-1} = A^{-1}A = I$. [3]

Question 6

(a) Solve the following system of equations using Cramer's rule [4]

$x + y = 5$

$z + y = 7$

$z + x = 6$

(b) Sum of two numbers is 20 and whose product is as large as possible. Find two positive numbers. [3]

Question 7

(a) Find $\frac{dy}{dx}$ if $y = \frac{\sqrt{x+1}+\sqrt{x-1}}{\sqrt{x+1}-\sqrt{x-1}}$. [4]

(b) If $A = \begin{bmatrix} 2 & 3 \\ -1 & 2 \end{bmatrix}$ and $f(x) = x^2 - 4x + 7$, show that $f(A) = 0$. [3]

Question 8

(a) How many committees of 4 members each can be formed with 3 captains and 2 teachers so as to include at least one teacher? [3]

(b) $\int \frac{6x-3}{\sqrt{x^2-x+3}} dx$ [4]

Question 9

(a) Find the inverse of $\begin{bmatrix} 2 & 0 & -1 \\ 5 & 1 & 0 \\ 0 & 1 & 3 \end{bmatrix}$ [4]

(b) Differentiate $x^2 - 3x + 5$ with respect to $2 - x$ [3]

Question 10

(a) If $y = (1-x)\sqrt{x+3}$, find $\frac{dy}{dx}$. [3]

(b) In how many ways can 15 things divided into 3 groups containing 8, 4 and 3 things respectively. [3]

Question 11

(a) $\int \frac{1}{x^2 - x - 30} dx$ [4]

(b) If $A = \begin{bmatrix} 2 & 4 & -1 \\ -1 & 0 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 2 \\ 1 & 3 \\ -1 & 0 \end{bmatrix}$ prove that $(AB)^T = B^T A^T$ [3]

Qusetion 12

(a) Show that $\begin{vmatrix} 1 & m & n+p \\ 1 & n & p+m \\ 1 & p & m+n \end{vmatrix} = 0$ [3]

(b) Find the point on the curve $y = x^3 - 3x^2 + 3x$, where the gradient is zero and determine the nature of these points. [4]

Question 13:

(a) Find n if $\dfrac{(2n)!}{3!(2n-3)!} : \dfrac{n!}{2!(n-2)!} = 44 : 3$. [4]

(b) $\int (x-4)\sqrt{x^2-2x+3}dx$ [3]

Question 14

(a) Find the turning values of the following functions, distinguishing each case whether the value is maximum, minimum or the inflexional. [4]

$y = 4x^3 + 19x^2 - 14x + 3$

(b) $\int \frac{x}{x+3} dx$ [4]