MOTITHANG HIGHER SECONDARY SCHOOL

THIMPHU THROMDE

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

ANNUAL EXAMINATION 2018

Class: XI Arts & Commerce **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																	
Section B		**Q 10**		**Q 11**		**Q 12**		**Q 13**		**Q 14**		**Marker's initial**					
Marks	**70**	**a**	**b**	**a**	**b**	**a**	**b**	**a**	**b**	**a**	**b**						
		3	**4**	**3**	**4**	**2**	**5**	**3**	**4**	**3**	**4**						
Marks Awarded																	
Total Marks Awarded	**Section A + Section B =**																

READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. Answer Question 1 from Section A and 10 Questions from Section B

2. All working including rough work should be done on the same paper adjacent to the rest of the answers.

3. The intended marks for questions or parts of the questions are given in brackets

4. The use of calculator (fx – 82 or fx – 100) is allowed.

5. Mathematical formula is given at the end of this question paper.

Section: "A" (Compulsory) [2x15= 30 MARKS]

Direction: Read the following questions carefully, for each question there are *four* alternatives A, B, C and D. choose the correct alternative and write it in your answer sheet.

Question 1:

i) Roots of the quadratic equation $x^2 + x - 12 = 0$ are

A) $1, 2$

B) $2, 3$

C) $-3, 4$

D) $-4, 3$

ii) The 10^{th} term of the sequence $2, 6, 10, \cdots$ is equal to

A) 35

B) 36

C) 37

D) 38

iii) The sum of 8 terms of the series $3 + 6 + 12 + \cdots$ is

A) 750

B) 755

C) 760

D) 765

iv) If $\log_3 a = 2$ then value of a is

A) 9

B) 10

C) 11

D) 12

v) If the expression $x^3 - 7x + 4$ is divided by $x + 2$ then the remainder is

A) 6

B) 8

C) 10

D) 12

vi) $\frac{\pi}{12}$ Radian is equal to

A) 10^0

B) 12^0

C) 14^0

D) 15^0

vii) The area of a sector of a circle is $5.024\ cm^2$ and it subtends an angle of $36°$ at the centre of the circle , then radius of the circle is

A) 4 cm.

B) 5 cm

C) 6 cm.

D) 7 cm.

viii) The value of $sec^2\theta - 1 - tan^2\theta$ is

A) 0

B) 1

C) 2

D) 3

ix) Which trigonometric function is positive in the 2nd quadrant?

A) $sin\ \theta$

B) $cos\ \theta$

C) $tan\ \theta$

D) None of the above

x) The value of $cos5\theta.cos2\theta - sin5\theta.sin2\theta$ is equal to

A) $cos\theta$

B) $cos3\theta$

C) $cos5\theta$

D) $cos7\theta$

xi) If $f(x) = \frac{7}{4}x^2$, then the value of $f'\left(\frac{1}{7}\right)$ is

A) $\frac{7}{2}$

B) $\frac{1}{2}$

C) $\frac{1}{7}$

D) $\frac{3}{2}$

xii) If $y = \sqrt{5x+7}$ then $\frac{dy}{dx}$ is

A) $\frac{7}{\sqrt{5x+7}}$

B) $\frac{5}{\sqrt{5x+7}}$

C) $\frac{5}{2\sqrt{5x+7}}$

D) None of the above

xiii) The middle point of the line joining the points $A(-4, 3)$ and $B(6, -7)$ is

A) $(3,\ 1)$

B) $(1,\ -2)$

C) $(4,\ 5)$

D) $(-1,\ 4)$

xiv) If the points $A\,(\,7\,,a\,)\,,B\,(\,-5\,,2\,)\;and\;\;C\,(\,3\,,6\,)$ are collinear, then the value of a is

A) 6

B) 7

C) 8

D) 9

xv) The equation of the line joining the points $A\,(\,1\,,1\,)\;and\;\;B\,(\,2\,,3\,)$ is

A) $2x-y-1=0$

B) $2x+y+1=0$

C) $2x-y+1=0$

D) $2x+y-1=0$

Section B: Answer any TEN questions. [7 × 10 = 70 Marks]

Question 2

A) Find the value of $k\;so\;that\;\;k+2,\;\;4k-6\;and\;\;\;3k-2$ are three consecutive terms of an A.P. [3]

B) Solve for x $\log_{10}(10x+5)-\log_{10}(x+4)=\log_{10}2$ [4]

Question 3

A) A man borrows Nu. 32,760 without interest and agrees to pay back in 12 monthly installments, each installment being twice the preceding one. Find the second and the last installment. [4]

B) Factorize the given function; $f(x)=x^3-3x^2-9x-5$ [3]

Question 4 A) Prove that $\frac{1}{\log_a ab}+\frac{1}{\log_b ab}=1$ [2]

B) Resolve into partial fraction; $\frac{x+2}{x^2-7x+12}$ [5]

Question 5

A) Find the value of a, if the expression $x^3+ax+2a-2$ is exactly divisible by $x+1$. [2]

B) Draw the graph for the following quadratic function and identify the four important points of the graph; $y=x^2-6x+9$ [5]

Question 6

A) Find the area of the sector of a circle having radius 5 cm and its arc length is 10 cm. [3]

B) Solve the given quadratic equation; $\frac{x}{2}+\frac{6}{x}=4$ [4]

Question 7

A) The minute hand of a clock is 15 cm. long .How far does the tip of the hand move during 40 min. [3]

B) Find the value of $\sin(\alpha+\beta)$ if $sin\alpha=\frac{3}{5}$, $cos\beta=\frac{5}{13}$, $\alpha\ and\ \beta\ in\ Quadrant\ I$ [4]

Question 8 A) Prove that $sin^2A\times cot^2A+cos^2A\times tan^2A=1$ [3]

B) Prove that $\frac{sin7x+sin3x}{cos7x+cos3x}=tan5x$ [4]

Question 9 A) Prove that $\sin 60°=\frac{2\tan 30°}{1+tan^2\,30°}$ [3]

B) Find $\frac{dy}{dx}$ for the following functions; [4]

i) $y=5x^4+4x^3-3x^2+2x+7$ ii) $y=\frac{x^3+2x}{x^2+4}$

Question 10

A) Find the area of the triangle whose vertices are ; $A(4\,,2)\,,B(4\,,5)\ and\ C(-2\,,2)$ [3]

B) If $f(x)=\frac{x+2}{X-2}$ then find $f'(-2)$. [4]

Question 11

A) Find the point of division, which divides a line joining $A(8\,,9)\ and\ B(-7\,,4)$ in the ratio $2:3$ internally. [3]

B) Given $u=4x^2+1$ and $v=4x+\frac{1}{x^3}$, find $\frac{du}{dx}$ and $\frac{dv}{dx}$ [4]

Question 12

A) Find the equation of a straight line having $y\ intercept=2\ and\ is\ inclined\ at\ 45°\ to\ the\ X\ axis$ [2]

B) Find the interior angles of a triangle whose vertices are $A(4\,,3)$, $B(-2\,,2)$ $and\ \ C(2\,,-8)$ [5]

Question 13

A) Find the equation of a straight line passing through $P(4\,,3)$ and is parallel to the line

$3x + 4y = 12$ [3]

B) Find the equation of the line joining the origin to the point of intersection of the lines

$4x + 3y = 8$ and $x + y = 1$. [4]

Question 14

A) Write down the equation of a straight line cutting off intercepts $a = 5$ from $X\ axis$ and $b = -6$ from the $Y\ axis$. [3]

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B) Determine the angle between the lines $2x - y + 3 = 0$ and $x + y - 2 = 0$. [4]

Formulae Reference

Algebra
Sequence and Series

1. Last term or nth term of A.P $T_n = a + (n-1)d$ 2. Middle term $T_2 = \frac{T_1 + T_3}{2}$
3. Sum to n terms of A..P $S_n = \frac{n}{2}\{2a + (n-1)d\}$ 4. Last term or nth term of G.P $T_n = ar^{n-1}$
5. Sum to infinity $S_\infty = \frac{a}{1-r}$
6. Sum to G.P terms $i)\ S_n = \frac{a(r^n-1)}{r-1}$ $when\ r > 1$ $ii)\ S_n = \frac{a(1-r^n)}{1-r}$ $when\ r < 1$

Logarithms

1. $\log_n(a \times b) = \log_n a + \log_n b$ 2. $\log_n \frac{a}{b} = \log_n a - \log_n b$ 3. $\frac{1}{\log_b a} = \log_a b$
4. $\log_b a^n = n \log_b a$ 5. $If\ \log_a b = x\ \ \therefore\ a^x = b$

Quadratic Equation

1. For any quadratic equation $ax^2 + bx + c = 0$ $where\ a \neq 0$
$Roots\ of\ the\ quadratic\ equations\ are\ \alpha\ and\ \beta$
$\alpha = \frac{-b+\sqrt{D}}{2a}$ and $\beta = \frac{-b-\sqrt{D}}{2a}$ $where\ D = b^2 - 4ac$

Trigonometry
Angles and Arc Lengths

1. Conversion
a) Degree to Radian $x° = x \times \frac{\pi}{180°}$ b) Radian to Degree $x\ Radian = x \times \frac{180°}{\pi}$
2. Relation among $l\,, r\ and\ \theta \rightarrow l = r \times \theta$ where θ must be in Radian

3. Area of a Sector of a Circle

$a)\ Area\ of\ a\ Sector = \frac{1}{2} \times r^2 \times \theta$ $b)\ Area\ of\ a\ Sector = \frac{1}{2} \times l \times r$ where θ must be in Radian

Trigonometrical Functions

1. Trigonometric Ratios

$i)\ \sin\theta = \frac{O}{H}$ $ii)\ \cos\theta = \frac{A}{H}$ $iii)\ \tan\theta = \frac{O}{A}$ $iv)\ \csc\theta = \frac{H}{O}$ $v)\ \sec\theta = \frac{H}{A}$ $vi)\ \cot\theta = \frac{A}{O}$

2. $i)\ H = \sqrt{O^2 + A^2}$ $ii)\ O = \sqrt{H^2 - A^2}$ $iii)\ A = \sqrt{H^2 - O^2}$

3) Pythagorean identities

$i)\ sin^2\theta + cos^2\theta = 1$ $ii)\ sec^2\theta - tan^2\theta = 1$ $iii)\ cosec^2\theta - cot^2\theta = 1$

Compound and Multiple Angles

1. $i)\ \sin(A \pm B) = \sin A \times \cos B \pm \cos A \times \sin B$ $ii)\ \cos(A \pm B) = \cos A \times \cos B \mp \sin A \times \sin B$

$iii)\ \tan(A + B) = \frac{\tan A + \tan B}{1 - \tan A \times \tan B}$ $iv)\ \tan(A - B) = \frac{\tan A - \tan B}{1 + \tan A \times \tan B}$

2. $i)\ \sin 2\theta = 2\sin\theta \times \cos\theta$ $ii)\ \cos 2\theta = cos^2\theta - sin^2\theta$ $iii)\ \tan 2\theta = \frac{2\tan\theta}{1 - tan^2\theta}$

3. $i)\ \sin C + \sin D = 2\sin\frac{C+D}{2} \times \cos\frac{C-D}{2}$ $ii)\ \sin C - \sin D = 2\cos\frac{C+D}{2} \times \sin\frac{C-D}{2}$

$iii)\ \cos C + \cos D = 2\cos\frac{C+D}{2}\cos\frac{C-D}{2}$ $iv)\ \cos C - \cos D = 2\sin\frac{C+D}{2} \times \sin\frac{D-C}{2}$

Coordinate Geometry

Points and their coordinates in 2 Dimension

1. Coordinates of Middle Point of a line $x = \frac{x_1 + x_2}{2}$, $y = \frac{y_1 + y_2}{2}$

2. Distance between two points A and B $AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

3. Section formula

$a)\ Internal\ Section\ \ x = \frac{m_1x_2 + m_2x_1}{m_1 + m_2}$, $y = \frac{m_1y_2 + m_2y_1}{m_1 + m_2}$

$b)\ External\ Section\ \ x = \frac{m_1x_2 - m_2x_1}{m_1 - m_2}$, $y = \frac{m_1y_2 - m_2y_1}{m_1 - m_2}$

Where the line AB divided by the ratio $m_1 : m_2$

4. Area of a triangle having vertices $A(x_1, y_1)$, $B(x_2, y_2)$, $C(x_3, y_3)$ is

$= \frac{1}{2}|x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)|$ If three points are collinear then Area of $\Delta = 0$

Straight Lines

1. $i)\ Slope\ of\ a\ line = m = \tan\theta$ $ii)\ m = \frac{y_2 - y_1}{x_2 - x_1}$ $iii)\ Parallel\ condition\ \ m_1 = m_2$

$iv)\ Perpendicular\ condition\ \ m_1 \times m_2 = -1$ $v)\ Angle\ between\ two\ lines\ \theta = \tan^{-1}\left|\frac{m_1 - m_2}{1 + m_1 \times m_2}\right|$

2. Different forms of Straight lines

$i)\ Slope\ intercept\ form\ \ y = mx + c$ $ii)\ Point\ slope\ form\ \ y - y_1 = m(x - x_1)$

$iii)\ Standard\ equation\ of\ a\ line\ \ ax + by = c$

$iv)\ Two\ Point\ form\ \ y - y_1 = \frac{y_2 - y_1}{x_2 - x_1}(x - x_1)$ $v)\ Intercept\ form\ \ \frac{x}{a} + \frac{y}{b} = 1$

Differential Calculus
Derivatives of Algebraic functions

1. $If\ \ y = c\ \ then\ \ \frac{dy}{dx} = 0$ 2. $If\ \ y = x\ \ then\ \ \frac{dy}{dx} = 1$ 3. $If\ \ y = \frac{1}{x}\ \ then\ \ \frac{dy}{dx} = -\frac{1}{x^2}$

4. $If\ \ y = \sqrt{x}\ \ then\ \ \frac{dy}{dx} = \frac{1}{2\sqrt{x}}$ 5. $If\ \ y = \sqrt{ax \pm b}\ \ then\ \ \frac{dy}{dx} = \frac{a}{2\sqrt{ax \pm b}}$

6. $if\ \ y = x^n\ \ then\ \ \frac{dy}{dx} = nx^{n-1}$ 7. $If\ \ y = (ax \pm b)^n\ \ then\ \ \frac{dy}{dx} = na(ax \pm b)^{n-1}$

8. $If\ \ y = c \times f(x)\ \ then\ \ \frac{dy}{dx} = c \times \frac{d}{dx}[f(x)]$

9. $Product\ Rule\ \ If\ \ y = u \times v\ \ \ then\ \ \frac{dy}{dx} = uv' + vu'\ \ \ OR\ \ \frac{dy}{dx} = u\frac{dv}{dx} + v\frac{dv}{dx}$

$where\ \ u' = \frac{du}{dx}\ \ \ and\ \ v' = \frac{dv}{dx}$

10 . Quotient Rule $If\ \ y = \frac{u}{v}\ \ \ then\ \ \frac{dy}{dx} = \frac{vu' - uv'}{v^2}\ \ \ OR\ \ \frac{dy}{dx} = \frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2}$

$where\ \ u' = \frac{du}{dx}\ \ \ and\ \ v' = \frac{dv}{dx}$