

**MOTITHANG HIGHER SECONDARY SCHOOL  
THIMPHU THROMDE**

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

**TRIAL EXAMINATION 2019**

**Class: XII Commerce & Arts**

**Time: 3.15 Hours**

**Subject : Business Mathematics**

**Full Marks : 100**

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

**Invigilator’s initial:**

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<i>For Teacher’s use only</i>																	
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
Marks Awarded		3	4	4	3	4	3	3	4	3	4	4	3	3	4	3	4
Marker’s initial																	
Section B		Q 10		Q 11		Q 12		Q 13		Q 14		<b>Total Marks A+B =</b>  <b>Chief Marker’s initial :</b>					
Marks	70	a	b	a	b	a	b	a	b	a	b						
Marks Awarded		4	3	4	3	4	3	4	3	4	3						
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.**

**SECTION A**

Answer **ALL** questions

**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 X 15 = 30 MARKS]**

- i) Find the value of “n” if  $2^n P_6 = 10^n P_5$
- |       |       |
|-------|-------|
| A. 5  | C. 15 |
| B. 10 | D. 20 |

Answer:.....

- ii) The anti-derivative of  $\frac{1}{5-6x}$  with respect to x is:
- |                           |                            |
|---------------------------|----------------------------|
| A. $-6\log(5-6x)$         | C. $-\frac{\log(5-6x)}{6}$ |
| B. $\frac{\log(5-6x)}{5}$ | D. $\frac{\log(5-6x)}{6}$  |

Answer:.....

- iii) Pema decided to deposit Nu. 1,000 at the end of every year in a bank, which pays an interest rate of 5% per annum compounded annually. Her accumulation at the end of 10 years will be around:
- |               |               |
|---------------|---------------|
| A. Nu. 10,000 | C. Nu. 12,000 |
| B. Nu. 10,500 | D. Nu. 12,600 |

Answer:.....

- iv) What is the coordinates of point which is one-fifth the way from the points (3, 4, 5) to (-2, -1, 0)?
- |  |  |
|--|--|
| A. (2, 3, 4)                                       | C. (-2, 3, 4)  |
| B. $\left(-\frac{14}{5}, -\frac{17}{5}, -4\right)$ | D. $\left(\frac{13}{6}, \frac{19}{6}, \frac{25}{6}\right)$ |

Answer:.....

- v) A and B are singular matrix and non-singular matrix respectively. From the given matrices, find the value of  $x$ .  $A = \begin{bmatrix} 2 & 3 \\ 4 & x \end{bmatrix}$  and  $B = \begin{bmatrix} 2 & 3 \\ 4 & 8 \end{bmatrix}$
- A. 6  
B. 8  
C.  $x + 8$   
D.  $x - 8$

Answer:.....

- vi) At what point  $y = x^3 - 3x^2 + 3x$  is inflexional?
- A. (1, 0)  
B. (2, 1)  
C. (1, 1)  
D. (3, 2)

Answer:.....

- vii) The average cost associated with producing and marketing  $x$  unit of an item is given by  $AC = 2x - 11 + \frac{8}{x^2}$ . The range of the output for which marginal AC is increasing is:
- A.  $x < 5$   
B.  $x > 2$   
C.  $x < 2$   
D.  $x > 5$

Answer:.....

- viii) The gradient of the curve  $y = \sqrt{x} \left( 1 + \frac{1}{\sqrt{x}} \right)$  at (4, 5) is:
- A.  $\frac{1}{4}$   
B. 4  
C. 2  
D.  $\frac{1}{2}$

Answer:.....

- ix) The table below represents the rank of 5 students in two subjects, Accountancy and Commerce.

Accountancy	1	3	2	5	4
Mathematics	4	1	5	2	3

Which statement below best describe the correlation between the ranks in the two subjects?

- A. Weak Positive Correlation  
B. Moderate Positive Correlation  
C. Perfect Positive Correlation  
D. Moderate Negative Correlation

Answer:.....

- x) If the demand function is given by  $P = 25x - 2x^2$ , the marginal revenue at  $x = 6$  is;
- A. 78  
B. 13  
C. 468  
D. 84

Answer:.....



**SECTION B [10 x 7 = 70 MARKS]**

*Answer any 10 questions. All question in this section have equal marks. Unless otherwise stated. You may round off your answer to two decimal places.*

**Question 2**

a) Show that  $A(3,5,-4)$ ,  $B(-1,1,2)$  and  $C(-5,-5,-2)$  are the vertices of isosceles triangle.[3]

b) Evaluate  $\int \frac{1}{\sqrt{2x+3} - \sqrt{2x+1}} dx$ .

[4]

**Question 3**

a) In how many ways can the letters of the word 'COMBINE' be arranged so that:

(i) All the vowels never come together.

(ii) Vowel occupy only the odd places.

[4]

b) If  $\sqrt{x} - \sqrt{y} = \sqrt{a}$ , find  $\frac{dy}{dx}$ .

[3]

**Question 4**

- a) Using the properties of determinant, express  $|A|$  in factors where  $|A| = \begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix}$ . [4]



b) The cost function of a firm is given by  $C = 3x^2 - 2x + 3$ . Find

(i) the average cost

(ii) the marginal average cost when  $x = 3$ .

[3]

**Question 5**

- a) Equation of regression lines are  $4x + 3y = 0$  and  $3x + 4y + 8 = 0$ . Find the coefficient of correlation. [3]

- b) The cost of producing  $x$  pocket radio sets per day is Nu.  $\left(\frac{1}{4}x^2 + 35x + 25\right)$  and the price per set at which they may be sold is Nu.  $\left(50 - \frac{1}{2}x\right)$ . What should be the daily output to obtain maximum total profit? [4]

**Question 6**

a) Find the derivatives of  $\left(\frac{1}{x}\right)^x$  .

[3]

- b) Calculate Karl Pearson's coefficient of correlation between the value of X and Y for the following data: Point of observation (1, 3), (2, 2), (3, 5), (4, 4) and (5, 6) [4]

**Question 7**

a) Solve the following linear equations

$$x + y + z = 9,$$

$$2x + 5y + 7z = 52$$

$$2x + y - z = 0$$

[4]

- b) Calculate Spearman's coefficient of correlation and interpret the result of the marks obtained by nine students in Accounts and Mathematics given below. [3]

Physics	48	60	72	62	56	40	39	52	30
Mathematics	62	78	65	70	38	54	60	32	31

**Question 8**

- a) Suppose the cost to produce some commodity is a linear function of output. Find cost as a function of output, if the costs are Nu. 4000 for 250 units and Nu. 5000 for 350 units.

[3]



- b) Find the angle between the two lines segments joining the points  $(8,2,0)$ ,  $(4,6,-7)$  and  $(-3,1,2)$ ,  $(-9,-2,4)$ . [4]

**Question 9**

a) Differentiate  $\frac{2x}{x+1}$  with respect to  $\frac{1}{x}$

[3]

- b) A machine costing Nu.2,00,000 has effective life of 7 years and its scrap value is Nu. 30,000. What amount should the company put into a sinking fund earning 5% p.a so that it can replace the machine after its useful life? Assume that a new machine will cost Nu. 3,00,000 after 7 years. [4]

**Question 10**

a) Evaluate  $\int \frac{x-2}{(x-3)(x-4)} dx$ .

[4]

- b) If the coordinates of A and B be  $(2, 3, 4)$  and  $(1, -2, 1)$  respectively, prove that OA is perpendicular to OB where O is the origin. [3]

**Question 11**

- a) Find the relationship between the slope of marginal revenue curve and average revenue curve, for the demand function  $p = a - bx$ . [4]

- b) In how many ways can the letters of the word 'TRIANGLE' will be arranged? How many of these will begin with T and end with E? [3]

**Question 12**

- a) Find the maximum and the minimum values of the function  $2x^3 - 21x^2 + 36x - 20$  [4]



b) If  $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ , show that  $A(adjA) = |A|I$ . [3]

**Question 13**

- a) A person buys a television paying Nu. 5000 in cash and promising to pay Nu. 200 at the end of every month for next four years. If money is worth 12% per annum, converted monthly, what is the cash price of the television? [4]

b) Evaluate  $\int \frac{8x-6}{\sqrt{2x^2-3x+5}} dx$ .

[3]

**Question 14**

- a) Find the equation of line of regression Y on X from the following table: [4]

X	0	1	2	3	4	5	6
Y	2	1	3	2	4	3	5

- b) A line make an angle of  $\frac{\pi}{4}$  with each of the  $x$ -axis and  $y$ -axis. Find the angle made by it with the  $z$  - axis. [3]

***Rough Work***