Index No.:.....

BUSINESS MATHEMATICS
(Three hours and a quarter)

[The first 15 minutes of the examination is for reading the question paper **only**. Candidates must **NOT** start writing during this time.]

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*Answer **Question 1** from **section A** and **10** questions from **Section B.***
All working, including rough work, should be done on the same sheet as, and adjacent to, the rest of the answer.
The intended marks for questions or parts of questions are given in brackets [ ].

Mathematical formulae are given at the end of this question paper.
The use of calculator (fx-82/fx-100) is allowed.

Section A (30 marks)
Answer **ALL** Questions

Directions: 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 **[2 x 15 = 30]**

i. The mean value of the first five composite numbers is
a. 100 b. 7.4 c. 14.75 d. 0

ii. The range of 10, 15, 20, 5, 30, 50, 100, 17, 21, 2 is
a. 8 b. 27 c. 17.5 d. 98

iii. The roots of $(x-3)(2x+4)=0$ are
a. $3, -2$ b. 3, 4 c. $-3, 4$ d. $\frac{1}{2}, \frac{-1}{4}$

iv. If the first term and the common difference of a sequence are 5 and 4 respectively, then the tenth term is
a. 20 b. 1.25 c. 41 d. 0.8

v. The value of $\log_{25} 5$ is
a. $\log_5 25$ b. 2 c. -2 d. 0.5

vi. The median of 2, 5, 10, 4, 3, 7, 20 is
a. 4 b. 5 c. 12 d. 18

vii. If coefficient of quartile deviation and lower quartile are 0.5 and 25 respectively, then the value of upper quartile is
a. 2.5 b. $-\frac{3}{4}$ c. 10 d. 75

viii. The standard deviation of the first five natural numbers is
a. 1.41 b. -5 c. 2 d. 3.7

ix. The fifteenth term of the sequence $5, -10, 20, -40, \ldots$ is
a. 260 b. -28650 c. 81920 d. 18000

x. The logarithmic form of $\sqrt[3]{27} = 3$ is

a. $\log_{27} 3 = \frac{1}{3}$ b. $\log 5$ c. $\log \sqrt[3]{27} = 3$ d. 27

xi. If the mean of five elements is 30, then the sum of all the elements is

a. 60 b. 150 c. –56 d. 75.23

xii. If the standard deviation and mean are 25 and100 respectively, the coefficient of variation is

a .25 b. 4 c. 100 d. 400

xiii. The value of $\sqrt{-4} + \sqrt{-9} - \sqrt{-25}$ is

a. $\mathbf{10}i$ b. 12 c. $\sqrt{10}i$ d. 0

xiv. If $T_n = 5n - 4$, then the seventh term is

a. 81 b. 1 c. 31 d. –46

xv. If $\log_5 m = 3$, then the value of m is

a. 125 b. $\sqrt{5}$ c. $\sqrt[3]{5}$ d. –15

Section B (70 marks)

Answer any **10** questions. All questions in this section have equal marks. Unless otherwise stated, you may round your answer to 2 decimal points.

Question 2

a) Find the mean for the following data: [3]

Class	0—10	10—20	20—30	30—40	40—50
F	4	6	8	5	2

b) Resolve $\frac{x+2}{x^2 - 7x + 12}$ into partial fractions. [4]

Question 3

a) Find the median for the following data: [3]

X	10	5	20	15	30	25	35
F	6	4	10	12	17	20	5

b) The 5^{th} term of an A.P. is 11 and the 9^{th} term is 7. Find the 16^{th} term. [4]

Question 4

a) Solve for x: [3]

$\log_{10}(\log_2(\log_3 9)) = x$

b) Solve the quadratic equation by formula method: $\frac{x}{5} + \frac{28}{x+2} = 5$. [4]

Question 5

a) Find the sum to infinity of $\sqrt{2}-\frac{1}{\sqrt{2}}+\frac{1}{2\sqrt{2}}-\frac{1}{4\sqrt{2}}+...$ [3]

b) Resolve $\frac{7x-10}{(3x-4)(x-1)^2}$ into partial fractions [4]

Question 6

a) Find the sum of 50 terms of $57+49+41+.....$ [3]

b) Find the standard deviation for the following data: [4]

X	5	10	15	20	25	30
F	2	5	7	9	13	4

Question 7

a) Solve the equation by factorisation method: [3]

$x(2x+5)=3.$

b) simplify: [4]

i. $\log m^2-\log m$

ii. $\log m^2 \div \log m$

iii. $\log_{\sqrt{3}} 27-\log_{\sqrt{3}} 9$

Question 8

a) Find the upper quartile for the following data: [3]

Class	10—18	20—28	30—38	40—48	50—58
F	5	10	13	17	5

b) The 5th term and 7th term of a G.P. are 891 and 8019 respectively. Find the fifteenth term. [4]

Question 9

a) Evaluate: [3]

$\log\left(1+\frac{1}{3}\right)+\log\left(1+\frac{1}{4}\right)+\log\left(1+\frac{1}{5}\right)+...+\log\left(1+\frac{1}{80}\right).$

b) Find the quartile deviation for the following data: [4]

X	2	4	6	8	10	12
F	3	5	10	15	17	4

Question 10

a) Solve the quadratic equation by formula method: $6x^2+7x-20=0.$ [3]

b) Of how many terms is $\frac{55}{72}$, the sum of the series $\frac{2}{9}-\frac{1}{3}+\frac{1}{2}-....?$ [4]

Question 11

a) Solve by formula method: $15x^2 - 28 = x$. [3]

b) Find the partial fractions of $\frac{7-5x}{(2x-1)(x+1)}$ [4]

Question 12

a) Find the first quartile for the following data: [3]

Class	0—6	6—12	12—18	18—24	24—30
F	6	12	15	18	9

b) If the sum of terms of an A.P. is 136, the common difference is 4 and the last term is 31, then find n. [4]

Question 13

a) Find the mean value for the following data: [3]

X	2	4	6	8	10	12	14	16
F	3	5	7	11	6	4	5	3

b) Evaluate: [4]

i. $2^{\frac{1}{3}\log_2 27}$

ii. $\log_{\sqrt{2}}\left(\frac{1}{32}\right)$

Question 14

a) Find the second quartile for the following data: [3]

Class	0—5	5—10	10—15	15—20	20—25
F	4	6	8	15	12

b) Find the partial fractions of $\frac{x^2+3x-3}{(x-1)(x+2)}$ [4]

MATHEMATICAL FORMULAE

Coordinate Geometry

$$D = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$(x, y) = \left(\frac{m_1 x_2 + m_2 x_1}{m_1 + m_2}, \frac{m_1 y_2 + m_2 y_1}{m_1 + m_2} \right)$$

$$\tan\theta = \pm \frac{m_1 - m_2}{1 + m_1 m_2}$$

Algebra

$$T_n = a + (n+1)d$$

$$T_n = ar^{n-1}$$

$$S_n = \frac{n}{2}\left[2a + (n-1)d\right]$$

$$S_n = \frac{n}{2}\left[a + l\right]$$

$$S_n = \frac{a(1-r^n)}{1-r}$$

$$S_n = \frac{a - lr}{1-r}$$

$$S_\infty = \frac{a}{1-r}$$

$$a^2 - b^2 = (a+b)(a-b)$$

$$(a \pm b)^2 = a^2 \pm 2ab + b^2$$

In the quadratic equation

$$ax^2 + bx + c = 0, x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$n! = n(n-1)(n-2).....3.2.1$$

$${}^nC_r = \frac{n!}{r!(n-r)!}$$

$$T_{r+1} = {}^nC_r x^{n-r} y^r$$

$$(x+y)^n = {}^nC_0 x^n + {}^nC_1 x^{n-1} y + ... + {}^nC_n y^n$$

Commercial Mathematics

$$I = \frac{P \times R \times T}{100}$$

$$A = P\left(1 + \frac{r}{100}\right)^n$$

Calculus

$$y = x^n, y' = nx^{n-1},\ y = cf(x), y' = cf'(x)$$

If $y = u \pm v, then \frac{dy}{dx} = \frac{du}{dx} \pm \frac{dv}{dx}$

If $y = uv, then \frac{dy}{dx} = u\frac{dv}{dx} + v\frac{du}{dx}$

If $y = \frac{u}{v}, then \frac{dy}{dx} = \frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2}$

$$\int x^n dx = \frac{x^{n+1}}{n+1} + c$$

Statistics

$$\bar{x} = \frac{\sum x}{n}$$

$$\bar{x} = \frac{\sum fx}{\sum f}$$

$$Median = l_1 + \frac{l_2 - l_1}{f_1}(m - c)$$

$$\sigma = \sqrt{\frac{\sum \left(x_i - \bar{x}\right)^2}{n}} \ or \ \sqrt{\frac{\sum x^2}{n} - \left(\frac{\sum x}{n}\right)^2}$$

$$\sigma = \sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f}\right)^2}$$