BUSINESS MATHEMATICS
(Three hours and a quarter)

(The first 15 minutes of the examination are for reading the paper only. Candidate 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 adjacent to the rest of the answer. The intended marks for the 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 only allowed.

Section A [15 × 2 = 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

(i). The value of $2^{\log_2 3}$ is

A. 3 **C.** 0

B. 1 **D.** 2

(ii). The roots of the equation $x^2 = 16$ are

A. (4, 4) **C.** (−4, 4)

B. (2, 2) **D.** (2, −2)

(iii). The value of $\frac{\pi}{3} rad$ is equal to

A. 30^0 **C.** 45^0

B. 60^0 **D.** 90^0

(iv). The derivative of $(5x+7)^{10}$ is

A. $63(5x+7)^9$ **C.** $42(5x+7)^9$

B. $70(5x+7)^9$ **D.** $50(5x+7)^9$

(v). The derivative of $\sin(x+2)$ is

A. $\cos(x+2)$ **C.** $2\cos(x+2)$

B. $-\cos(x+2)$ **D.** $-2\cos(x+2)$

(vi). The value of $\frac{d}{dx}\left(\frac{\pi}{3}\right)$ is

A. 1 **C.** 0

B. $\frac{1}{3}$ **D.** π

(vii). Which term of the series 31 + 29 + 27 + … is 3?

A. 16 **C.** 32

B. 15 **D.** 30

(viii). The value of 0! is

A. 0 **C.** Not defined

B. ∞ **D.** 1

(ix). The value of $\dfrac{\sec^2\theta - 1}{\tan^2\theta}$ is

A. 1 **C.** 0

B. $\sec\theta$ **D.** $\tan\theta$

(x). $\int 1dx$ is equal to

A. 1 **C.** x

B. 0 **D.** $x + c$

(xi). The distance between two points (7, 9) and (4, 5) is

A. 4 units **C.** 5 units

B. 6 units **D.** 7 units

(xii). The slope and y-intercept of the equation $y = \sqrt{3}x - 7$ is

A. $(\sqrt{3}, -7)$ **C.** $(\sqrt{3}, 7)$

B. $(-\sqrt{3}, 7)$ **D.** $(-\sqrt{3}, -7)$

(xiii). The remainder of $2x^2 - 5x + 7$ when divided by $x - 1$ is

A. 4 **C.** 8

B. −4 **D.** −8

(xiv). If $\sin(90^0 + \theta) = \cos\theta$, then the value of $\cos(90^0 + \theta)$ is

A. $\sin\theta$ **C.** $-\sin\theta$

B. $\cos\theta$ **D.** $-\cos\theta$

(xv). An anti-derivative of $3\csc^2 x$ with respect to x is

A. $-3\cot x + c$ **C.** $3\cot x + c$

B. $-3\csc x + c$ **D.** $-\cot x + c$

Section B [10 × 7 = 70 marks]

Answer any 10 questions. All questions in this section have equal marks unless otherwise stated. You may round-off the answers to two decimal places.

Question 2

(a). Find the derivative of $y = \frac{x}{x^2+1}$ with respect to x **[4]**

(b). If $f(x) = (x-2)(x+3)$, find $f'(2)$ **[3]**

Question 3

(a). Factorize $x^3 - 19x - 30$ using remainder theorem **[3]**

(b). Find the sum of the term of $101 + 99 + 97 + \ldots + 47$? **[4]**

Question 4

(a). If α and β be the roots of the equation $x^2 - x + 2 = 0$, then find the value of $(\alpha+\beta)^2$ **[3]**

(b). Compute $\sin 15^0$ from the functions of 60^0 and 45^0 **[4]**

Question 5

(a). Evaluate $\int x^3\sqrt{x^4-1}dx$ by using the substitution method **[4]**

(b). Differentiate $y = x\tan x$ with respect to x **[3]**

Question 6

(a). Calculate the standard deviation for the following distribution **[4]**

x:	8	11	17	20	25	30	35
f:	2	3	4	1	5	7	3

(b). Evaluate $\int \sec^2(2x+1)dx$. **[3]**

Question 7

(a). If $\cos\theta = \frac{1}{10}$, find the value of $3\tan\theta - 5\sin\theta$ **[4]**

(b). Find the angle between the lines whose slopes are -3 and $-\frac{1}{2}$ **[3]**

Question 8

(a). Find x if the slope of the line joining $(-8, 11)$ and $(2, x)$ is $-\frac{4}{3}$ **[3]**

(b). Resolve into partial fraction $\frac{7-5x}{(2x-1)(x+1)}$ **[4]**

Question 9

(a). Find $\tan\theta$, if $\sin\theta = \frac{\sqrt{3}}{2}$ **[3]**

(b). Differentiate from first principles $y = x^2$ with respect to x **[4]**

Question 10

(a). Find the interquartile range from the following frequency distribution **[4]**

Wages (Nu)	10 − 20	20− 30	30 − 40	40 − 50	50 − 60	60 − 70	70 − 80
No. of persons	1	3	11	21	43	32	9

(b). Evaluate $\int \sin^2 x \cos x dx$ **[3]**

Question 11

(a). Find the equation of the line through the point (4, −5) and parallel to the line $3x + 4y + 5 = 0$? **[3]**

(b). Find the equation of the line which has the *y*-intercept equal to $\frac{4}{3}$ and is perpendicular to $3x - 4y + 11 = 0$ **[4]**

Question 12

(a). Evaluate $(x+2)^4$ using the binomial theorem **[3]**

(b). Show that point (1, 4), (3, −2) and (−3, 16) are collinear **[4]**

Question 13

(a). Resolve into partial fraction $\frac{x}{(x+2)^2}$ **[3]**

(b). Find the mode for the following distribution of test scores obtained by 134 students in mathematics examination **[4]**

Marks	0−10	10−20	20−30	30−40	40−50	50−60	60−70
No. of students	5	13	21	37	31	24	3

Question 14

(a). Find the area of the triangle whose vertices are (1, 3), (2, 4) and (5, 6) **[4]**

(b). Find the slope of a line perpendicular to the line which passes through the points (0, 8) and (–5, 2) **[3]**

Mathematical formulae

Algebra

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

(2) $(a \pm b)^3 = a^3 \pm 3a^2b + 3ab^2 \pm b^3$

(3) $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

(4) $x^{-n} = \dfrac{1}{x^n}, x \neq 0$

(5) $t_n = a + (n-1)d$

(6) $t_n = ar^{n-1}$

(7) $S_n = \dfrac{n}{2}\left(2a + (n-1)d\right)$

(8) $S_n = \dfrac{a(1-r^n)}{1-r}$, where $r < 1$

(9) $S_n = \dfrac{a(r^n - 1)}{r-1}$, where $r > 1$

Coordinate Geometry

(1). $(y - y_1) = m(x - x_1)$

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

(3). $(x, y) = \left(\dfrac{m_1x_2 + m_2x_1}{m_1 + m_2}, \dfrac{m_1y_2 + m_2y_1}{m_1 + m_2}\right)$

(4). Intercept Form: $\dfrac{x}{a} + \dfrac{y}{b} = 1$

(5). Normal Form: $x\cos\alpha + y\sin\alpha$

(6). Angle between two lines:

$\tan\theta = \left|\dfrac{a_1b_2 - a_2b_1}{a_1a_2 + b_1b_2}\right|$

(7). Distance of a point from a line

$d = \dfrac{|ax_1 + by_1 + c|}{\sqrt{a^2 + b^2}}$

Statistics

(1). Mean, $\bar{X} = A + \dfrac{\sum d_i}{n}$ & $\bar{X} = A + h.\dfrac{\sum fu}{\sum f}$

(2). Median, $Q = L + \dfrac{i}{f}\left(\dfrac{n}{2} - c\right)$

(3). Mode, $Z = L_1 + \dfrac{f_m - f_1}{2f_m - f_1 - f_2}$

(4). Standard Deviation, $\sigma = \sqrt{\dfrac{\sum x^2}{n} - \left(\dfrac{\sum x}{n}\right)^2}$

and $\sigma = i \times \sqrt{\dfrac{\sum fu^2}{\sum f} - \left(\dfrac{\sum fu}{\sum f}\right)^2}$

Calculus

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

(2). $y = cf(x), \quad y' = cf'(x)$

(3). $\dfrac{d}{dx}(uv) = u\dfrac{dv}{dx} + v\dfrac{du}{dx}$

(4). $\dfrac{d}{dx}(u \pm v) = \dfrac{du}{dx} \pm \dfrac{dv}{dx}$

(5). $\dfrac{d}{dx}\left(\dfrac{u}{v}\right) = \dfrac{v\dfrac{du}{dx} - u\dfrac{dv}{dx}}{v^2}$

(6). $\dfrac{dy}{dx} = \dfrac{dy}{du} \times \dfrac{du}{dx}$

(7). $\int x^n dx = \dfrac{x^{n+1\rightarrow}}{n+1} + c, \; n \neq -1$

(8). $\int \left[f(x)\right]^n f'(x)dx = \dfrac{\left[f(x)\right]^{n+1}}{n+1}, n \neq -1$

Trigonometry

(1). $\sin^2\theta + \cos^2\theta = 1$

(2). $\sec^2\theta = 1 + \tan^2\theta$

(3). $\csc^2\theta = 1 + \cot^2\theta$

(4). $\sin(A \pm B) = \sin A\cos B \pm \cos A\sin B$

(5). $\cos(A \pm B) = \cos A\cos B \mp \sin A\sin B$

(6). $\tan(A \pm B) = \dfrac{\tan A \mp \tan B}{1 \mp \tan A\tan B}$

(7). $\sin C + \sin D = 2\sin\dfrac{C+D}{2}\cos\dfrac{C-D}{2}$

(8). $\sin C - \sin D = 2\cos\dfrac{C+D}{2}\cos\dfrac{C-D}{2}$

(9). $\cos C + \cos D = 2\cos\dfrac{C+D}{2}\cos\dfrac{C-D}{2}$

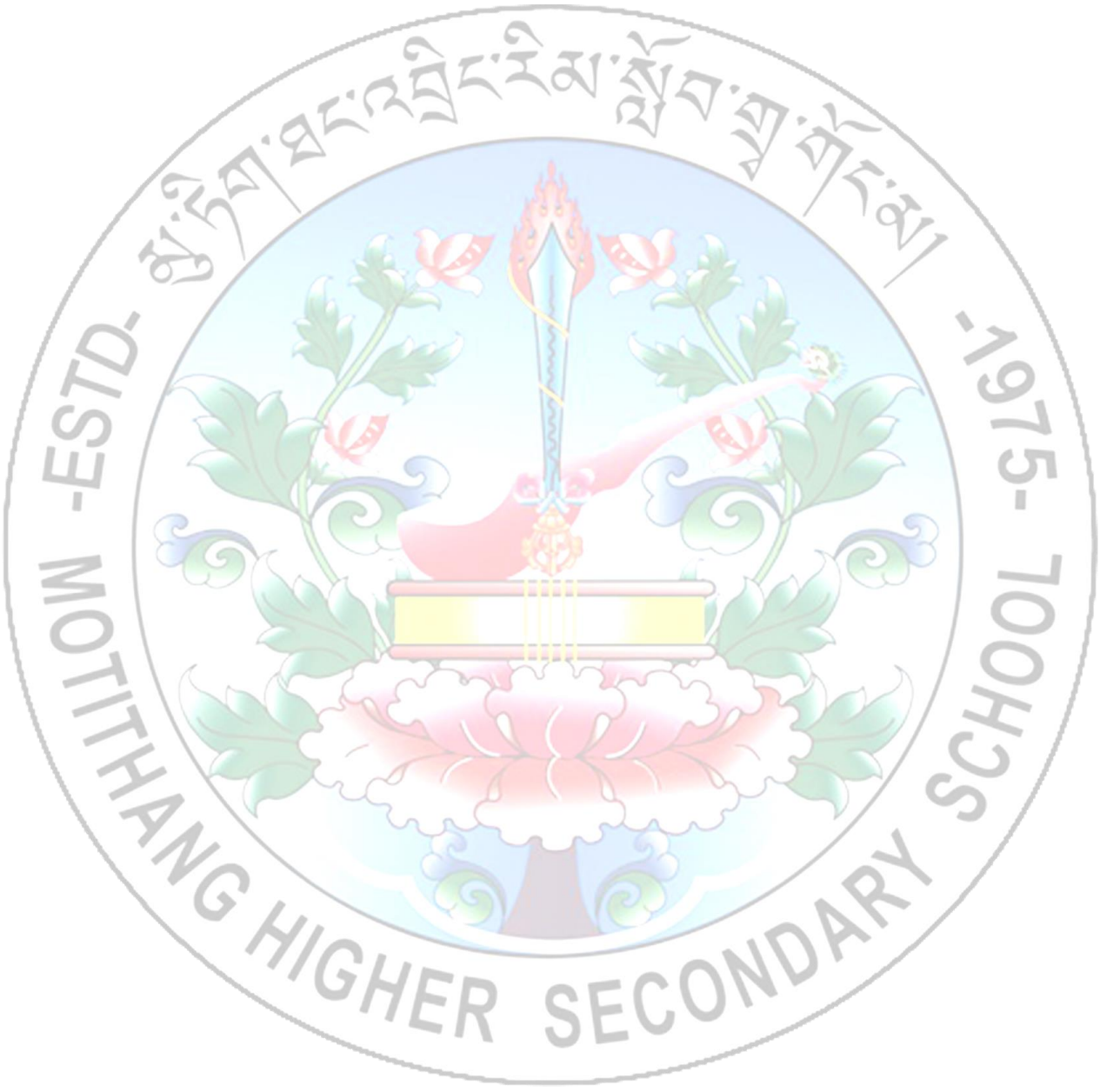
(10). $\cos C - \cos D = 2\sin\dfrac{C+D}{2}\sin\dfrac{D-C}{2}$

(11). $2\sin A\cos B = \sin(A+B) + \sin(A-B)$

(12). $2\cos A\sin B = \sin(A+B) - \sin(A-B)$

(13). $2\cos A\cos B = \cos(A+B) + \cos(A-B)$

(14). $2\sin A\sin B = \cos(A-B) - \cos(A+B)$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