



The Times Secondary School

Dillibazar, Kathmandu

First Terminal Examination – 2080

Grade: - XI

Set A

Full Marks:-75

Stream: Science

Pass Marks:-30

Subject: - Mathematics

Time : 3hrs

Candidates are required to give their answers in their own words as far as practicable. The figures in the margin indicate the full marks.

Group A (1 × 11 = 11)

Select the best alternative.

- If i denotes the imaginary unit then $\frac{1}{i} + \frac{1}{i^2} + \frac{1}{i^3} + \frac{1}{i^4}$ equals
a) -1 b) 1 c) $-i$ d) i
- If AM, GM and HM be arithmetic, geometric and harmonic mean respectively, the correct option is
a) $AM > HM > GM$ b) $AM > GM > HM$
c) $AM < GM < HM$ d) $HM < AM < GM$
- If A be a square matrix and $a_{ij} = a_{ji}$ for all i, j then A is called
a) Identity matrix b) triangular matrix
c) symmetric matrix d) skew-symmetric matrix
- A square matrix A is called a non-singular matrix if
a) $|A| = 0$ b) $|A| \neq 0$ c) $|A| = 1$ d) $|A| \neq 1$.
- The square of the standard deviation is known as
a) coefficient of variance b) variance
c) coefficient of standard deviation d) mean deviation
- Skewness of a distribution is positive if
a) Mean > Median > Mode b) Mode < Mean < Median
c) Mean > Mode > Median d) Mean = Median = Mode
- The discriminant of the quadratic equation $ax^2 + bx + c = 0$ is
a) $4abc - a^2$ b) $4ac - b^2$ c) $b^2 - 4ac$ d) $4bc - a^2$
- The length of perpendicular from (0, 0) to the straight line $3x + 4y + 5 = 0$ is
a) 1 b) 2 c) 3 d) 4
- The points of discontinuity of the function $f(x) = \frac{x+1}{(x-2)(x-3)}$ are
a) -1, 2, 3 b) 0, 2, 3 c) 2, 3 d) -2, -3
- For what value of p, $\lim_{x \rightarrow 0} \frac{\sin px}{x} = 4$?
a) $p = 0$ b) $p = 1$ c) $p = 4$ d) $p = 12$
- For all rational values of n, $\lim_{n \rightarrow a} \frac{x^n - a^n}{x - a}$ equals to
a). ax^{n-1} b). x^{n-1} c) na^{n-1} d) 1

Group B [5 × 8 = 30]

- Find the square roots of $7 - 24i$ [3]
b) If $x - iy = \sqrt{\frac{1-i}{1+i}}$, prove that $x^2 + y^2 = 1$ [2]

13. Using the properties of determinant, show that

$$\begin{vmatrix} 1 + a_1 & a_2 & a_3 \\ a_1 & 1 + a_2 & a_3 \\ a_1 & a_2 & 1 + a_3 \end{vmatrix} = 1 + a_1 + a_2 + a_3$$

14. a) Define limit of a function. Give some examples of indeterminate forms [1+1]

b) Evaluate : $\lim_{x \rightarrow \theta} \frac{x \cos \theta - \theta \cos x}{x - \theta}$ [3]

15. If the equations $x^2 + px + q = 0$ and $x^2 + qx + p = 0$ have a common root, prove that either $p = q$ or $p + q + 1 = 0$.

16. Define continuity of a function at a point. A function is defined by

$$f(x) = \begin{cases} 2x - 3 & \text{for } x < 2 \\ 2 & \text{for } x = 2 \\ 3x - 5 & \text{for } x > 2 \end{cases}$$
 . Is the function continuous at 2 ?

If not, how the function can be made continuous ? [1 + 3+1]

17 Find the inverse of the matrix $A = \begin{bmatrix} 1 & -1 & 1 \\ 2 & 1 & -3 \\ 1 & 1 & 1 \end{bmatrix}$

18. Calculate Karl Pearson's coefficient of skewness from the following data.

Weight(kg)	40-50	50-60	60-70	70-80	80-90
No. of persons	5	10	15	8	2

19. Following are the marks obtained by the students X and Y in 6 tests of 100 marks each

X	56	72	48	69	64	81
Y	63	74	45	57	82	63

If consistency of the performance is the criteria for awarding , who should get the prize?

Group C [8 × 3 = 24]

- Find the multiplicative inverse of $2 + 5i$ [2]
b) If H be the HM between a and b, prove that: $\frac{1}{H-a} + \frac{1}{H-b} = \frac{1}{a} + \frac{1}{b}$ [3]
c) Find the sum of the series $\frac{3}{5} + \frac{4}{5^2} + \frac{3}{5^3} + \frac{4}{5^4} + \frac{3}{5^5} + \frac{4}{5^6} + \dots$ [3]
- a) If two coins are tossed once, find the probability of getting at least one tails [2]
b) If roots of the equation $x^2 + ax + c = 0$ differ by 1, prove that $a^2 = 4c + 1$. [3]
c) Form the quadratic equation whose one root is $2 + \sqrt{3}i$ [2]
- (a) Evaluate $\lim_{x \rightarrow 2} \frac{x - \sqrt{8 - x^2}}{\sqrt{x^2 + 12} - 4}$ ii) $\lim_{x \rightarrow 0} \frac{e^{bx} - e^{ax}}{x}$ [3+2]
b) For what of value of k the function $f(x) = \begin{cases} kx + 3, & x \geq 2 \\ 3x - 1, & x < 2 \end{cases}$ is continuous at $x = 2$? [3]

The End



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Group A (1 × 11 = 11)

Select the best alternative.

- If i denotes the imaginary unit then i^{4n+3} equals
 - 1
 - 1
 - i
 - i
- If a, b and c be in harmonic progression, then
 - $b = ac$
 - $b = \sqrt{ac}$
 - $b = \frac{a+c}{2}$
 - $b = \frac{2ac}{a+c}$
- If A be a square matrix and $a_{ij} = -a_{ji}$ for all i, j , then A is called
 - Identity matrix
 - triangular matrix
 - symmetric matrix
 - skew-symmetric matrix
- A square matrix A is called a singular matrix if
 - $|A| = 0$
 - $|A| \neq 0$
 - $|A| = 1$
 - $|A| \neq 1$
- The coefficient of variation (C.V.) is defined by
 - $\frac{\sigma}{\bar{x}}$
 - $\frac{\sigma}{\bar{x}} \times 100$
 - $\frac{\bar{x}}{\sigma}$
 - $\frac{\bar{x}}{\sigma} \times 100$
- A frequency distribution is said to be symmetrical if
 - Mean > Median > Mode
 - Mode < Mean < Median
 - Mean > Mode > Median
 - Mean = Median = Mode
- The length of perpendicular from $(0, 0)$ to the straight line $3x + 4y + 10 = 0$ is
 - 1
 - 2
 - 3
 - 4
- The points of discontinuity of the function $f(x) = \frac{x+2}{(x-1)(x-3)}$ are
 - 1, -2, 3
 - 1, 3
 - 1, 2, 3
 - 1, -3
- For what value of k , $\lim_{x \rightarrow 0} \frac{\log_e(1+kx)}{x} = 1$?
 - $k = 0$
 - $k = -1$
 - $k = 1$
 - $k = 2$
- $\lim_{\theta \rightarrow 0} \frac{\sin\sqrt{\theta}}{\sqrt{\sin\theta}}$ equals
 - $\frac{0}{0}$
 - 0
 - 1
 - $\sqrt{\theta}$

Group B [5 × 8 = 30]

- Find the square roots of $3-4i$ [3]
 - If $x - iy = \frac{2-3i}{2+3i}$, prove that $x^2 + y^2 = 1$ [2]
- Using the properties of determinant, show that

$$\begin{vmatrix} x & y & z \\ x^2 & y^2 & z^2 \\ yz & zx & xy \end{vmatrix} = (x-y)(y-z)(z-x)(yz + zx + xy)$$
- Define continuity of a function at a point. Let a function $f(x)$ be defined by

$$f(x) = \begin{cases} 2x+1 & \text{if } x < 1 \\ 2 & \text{if } x = 1 \\ 3x & \text{if } x > 1 \end{cases}$$

Is the function continuous at $x=1$?

- If not, how can you make it continuous at the point? [1 +3+ 1]
- If the equations $x^2 + px + q = 0$ and $x^2 + qx + p = 0$ have a common root, prove that either $p = q$ or $p + q + 1 = 0$.
 - Find the inverse of the matrix $A = \begin{pmatrix} 1 & 2 & 1 \\ 0 & 1 & 6 \\ 1 & 3 & 2 \end{pmatrix}$

- a) Define limit of a function. Give some examples of indeterminate forms [1+1]

b) Evaluate: $\lim_{x \rightarrow \theta} \frac{x \sin \theta - \theta \sin x}{x - \theta}$. [3]

- Calculate Karl Pearson's coefficient of skewness from the following data

Wage (Rs '000")	10-20	20-30	30-40	40-50	50-60
No. of persons	3	8	10	7	2

- Following are the runs scored by two batsmen A and B in six different innings.

A	72	76	67	65	64	75
B	55	67	59	57	52	63

If consistency of the performance is the criteria for awarding the medal, who should be awarded?

Group C [8 × 3 = 24]

- a) Find the multiplicative inverse of $\frac{3+i}{3-i}$. [2]
 - If G be the GM between a and b , prove that: $\frac{1}{G^2 - a^2} + \frac{1}{G^2 - b^2} = \frac{1}{G^2}$ [3]
 - Find the sum of the series $\frac{3}{5} + \frac{4}{5^2} + \frac{3}{5^3} + \frac{4}{5^4} + \frac{3}{5^5} + \frac{4}{5^6} + \dots$ [3]
- a) If roots of the equation $x^2 + ax + c = 0$ differ by 1, prove that $a^2 = 4c + 1$. [3]
 - Form the quadratic equation whose one root is $4 + 2i$ [3]
 - If two coins are tossed once, find the probability of getting both tails. [2]
- a) Evaluate i) $\lim_{x \rightarrow 0} \frac{e^x - \sin x - 1}{x}$ ii) $\lim_{x \rightarrow 2} \frac{x - \sqrt{2-x^2}}{2x - \sqrt{2+2x^2}}$ [2+3]
 - For what of value of k the function $f(x) = \begin{cases} x^2 - 1, & x \geq 3 \\ 2kx, & x < 3 \end{cases}$ is continuous at $x = 3$? [3]

The End