

MATHEMATICS Part-I	Paper Code	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;">Roll No. of the Student</td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> </tr> </table>	Roll No. of the Student						
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Time: 20 Minutes	Marks: 20								
Multiple Choice Questions 01 Mark for each	① ● ③	Serial No. Of the Answer Book _____							

SECTION-A

Note:

- 1) Attempting all MCQs is compulsory. This paper along with the OMR sheet must be returned to the superintendent after due time.
- 2) Fill the circle (A)(B)(C)(D), which one is correct with blue or black ball point, in this sheet as well as in separate OMR Sheet like ●
- 3) If more than one circle in the OMR sheet is filled then no credit will be given to such answer.

- I.i. If two rows of a square matrix A are interchanged, the determinant of the resulting matrix = _____.
- (A) |A| (B) 0 (C) 1_n (D) $-|A|$
- ii. If in a right angled $\triangle ABC$ $\alpha=45^\circ$ then the triangle is _____.
- (A) Isosceles (B) Equilateral (C) Obtuse (D) Scalene
- iii. Period of $5\tan(2x)$ is _____.
- (A) Π (B) 2π (C) $\frac{\pi}{2}$ (D) 5π
- iv. If the common ratio of a geometric series $g_1, g_2, g_3, \dots$ is r, then the common ratio of $g_1^3, g_2^3, g_3^3, \dots$ will be _____.
- (A) R (B) r^2 (C) $\frac{1}{r^3}$ (D) r^3
- v. If ${}^nC_r = {}^nC_q$ then _____.
- (A) $r-q=n$ (B) $r+q=n$ (C) $r+n=q$ (D) $n+q=r$
- vi. $1-x+x^2-x^3+\dots$ is the expansion of _____.
- (A) $(1-x)^{-2}$ (B) $(1-x)^{-1}$ (C) $(1+x)^{-2}$ (D) $(1+x)^{-1}$
- vii. If $\vec{c}$ lies in the plane of $\vec{a}$ & $\vec{b}$, then $\vec{c} =$ _____.
- (A) $\alpha\vec{a}+\beta\vec{b}$ (B) $\alpha\vec{a} \times \beta\vec{b}$ (C) $\alpha\vec{a} \cdot \beta\vec{b}$ (D) $\vec{0}$
- viii. Range of $f(x)=x^2$ is the set of all _____ real numbers.
- (A) Negative (B) Positive (C) Non-negative (D) Non-positive
- ix. $\cos^{-1} A + \cos^{-1} B = \cos^{-1}$ _____.
- (A) $(A+B)$ (B) $(AB - \sqrt{1-A^2} \sqrt{1-B^2})$ (C) (AB) (D) $(A-B)$
- x. If $Z + \frac{1}{i} = 2$ then $Z =$ _____.
- (A) $2+i$ (B) $2i+1$ (C) $2i-1$ (D) $2-i$
- xi. The range of $y=2 \sin(3x+1)$ is _____.
- (A) R (B) $R-\{2\}$ (C) $[-2,2]$ (D) $[-1,1]$
- xii. Let $A = \begin{bmatrix} 3 & -2 \\ 1 & 5 \end{bmatrix}$. Then the co-factor of -2 is _____.
- (A) -5 (B) 2 (C) -2 (D) 5
- xiii. The value of $2 \cos^2(\frac{x}{2}) =$ _____.
- (A) $1+\cos x$ (B) $1-\cos x$ (C) $1+\sin x$ (D) $1-\sin x$
- xiv. The arithmetic and geometric mean of two positive real numbers with usual notation are related by _____.
- (A) $A > G$ (B) $A = G$ (C) $A < G$ (D) $A \geq G$
- xv. If A is rectangular matrix then $A-A^t$ is _____.
- (A) Singular (B) Non-singular (C) Symmetric (D) Skew-symmetric
- xvi. A fair die is rolled, the probability that dots on top are greater than 4 is _____.
- (A) $\frac{1}{3}$ (B) $\frac{1}{2}$ (C) $\frac{1}{4}$ (D) $\frac{1}{6}$
- xvii. Sum of the A.P $-11 + (-9) + (-7) + \dots$ up to 6 terms is _____.
- (A) 12 (B) -12 (C) -36 (D) 36
- xviii. When a fair coin is tossed two times, then sample space is _____.
- (A) {HH, TT} (B) {HH, HT, TH, TT} (C) {T, T} (D) {HT, TH}
- xix. If $\frac{p}{q}$ is the third term of H.P, then third term of corresponding A.P will be _____.
- (A) P (B) $\frac{q}{p}$ (C) q (D) $-\frac{p}{q}$
- xx. The expansion $(1+2x)^{-1}$ is valid for _____.
- (A) $|x| < \frac{1}{2}$ (B) $|x| > \frac{1}{2}$ (C) $|x| = \frac{1}{2}$ (D) $|x| \geq \frac{1}{2}$

MATHEMATICS Part-I

Note: Time allowed for section B and C is 2 hours and 40 minutes.

SECTION "B"

Marks: 50

I. Attempt any Ten Parts out of the following. Each Part carries equal marks.

- i. Separate into real & imaginary parts $\left(\frac{5-2i}{2+3i}\right)$.
- ii. Find the value of 'x' when $\begin{vmatrix} -1 & 0 & 1 \\ x^2 & 1 & x \\ 2 & 3 & 4 \end{vmatrix} = -6$.
- iii. If 'x' be so small that its square & higher power may be neglected, then evaluate $\frac{\sqrt{4+x}}{4-\frac{x}{3}}$.
- iv. How many eight digit different numbers are possible using all of the digits 1,1,1,1,2,2,3,4.
- v. Given two non-zero vectors $\vec{a}$ & $\vec{b}$ if $\vec{a} + \vec{b}$ & $\vec{a} - \vec{b}$ are perpendicular, then $|\vec{a}| = |\vec{b}|$.
- vi. Insert three harmonic means between $\frac{1}{6}$ & $\frac{1}{41}$.
- vii. Find the indicated term of the sequence $\frac{1}{2}, \frac{1}{5}, \frac{1}{8}, \dots, 9^{\text{th}}$ term.
- viii. Sum the series $1^3 + 5^3 + 9^3 \dots$ to n terms.
- ix. How many diagonals can be drawn in a plane figure with 8 sides?
- x. Prove that $2^n > n \forall n \in \mathbb{N}$.
- xi. Find the domain & range of $f(x) = \frac{x-3}{x+5}$.
- xii. Find the general solution of the equation $2\sin^2 x + 3\sin x - 2 = 0$.
- xiii. Show that $\sin^{-1} x + \cos^{-1} x = \frac{\pi}{2}$.

SECTION "C"

Marks: 30

Note: Attempt any Three questions of the following. Each question carries equal Marks.

- III. i. Let $A = \begin{bmatrix} 1 & 4 & 4 \\ 4 & 1 & 4 \\ 4 & 4 & 1 \end{bmatrix}$ show that $A^2 - 6A - 27I = O$, where I is the identity matrix.
- ii. Verify that $|Z_1 - Z_2| > |Z_1| - |Z_2|$ when $Z_1 = 2 + 3i$, $Z_2 = 1 - 5i$.
- IV. If $y = \frac{1}{2^2} + \frac{1.3}{2!} \cdot \frac{1}{2^4} + \frac{1.3.5}{3!} \cdot \frac{1}{2^6} + \dots$, then show that $y^2 + 2y - 1 = 0$.
- V. i. Find sum of the series $\sum_{k=1}^n \frac{1}{9k^2 + 3k - 2}$
- ii. For what value of 'n' will $\frac{a^{n+1} + b^{n+1}}{a^n + b^n}$ be the harmonic mean between 'a' & 'b'.
- VI. i. Find the area of $\triangle ABC$ where $\alpha = 18.4^\circ$, $b = 154\text{ft}$, $c = 211\text{ft}$.
- ii. Find a vector of magnitude 10 & perpendicular to $\vec{a} = 2\hat{i} - 3\hat{j} + 4\hat{k}$, $\vec{b} = 4\hat{i} - 2\hat{j} - 4\hat{k}$.