MATHEMATICS Part-I	Paper Code	Roll No. of the Student
Time: 20 Minutes — Marks: 20	(1) ● (3)	
Multiple Choice Questions 01 Mark for each		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) I_n (D) $-|A|$

ii. If in a right angled ΔABC $\alpha=45^0$ 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 $g_1, g_2, g_3, \ldots$ is r, then the common ratio of $g_1^3, g_2^3, g_3^3, \ldots$ 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. $1-x+x^2-x^3+\ldots$ 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 $A=\begin{bmatrix} 1 & -2 \\ 5 & 3 \end{bmatrix}$ Then the co-factor of -2 is ________.
(A) -5 (B) 2 (C) -2 (D) 5

xiii. The value of $2\cos^2\left(\frac{x}{2}\right)$ = ________.
(A) 1+cos x (B) 1-cos x (C) 1+sin x (D) 1-sin x

xiv. The arithematic 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 ≥ G

xv. If A is rectangular matrix then $A \cdot A^t$ 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 $-11+(-9)+(-7)+\ldots$ 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) $|x|\geq\frac{1}{2}$

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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 $\left(\frac{5-2i}{1+7i}\right)$.

ii. Find the value of 'x' when $\begin{vmatrix} -1 & 0 & 1 \\ x^3 & 1 & x \\ 2 & 3 & 4 \end{vmatrix} = -6$.

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 $\frac{1}{2}, \frac{1}{5}, \frac{1}{8}, \ldots\ldots 9^{th}$ term.

viii. Sum the series $1^3+5^3+9^3 \ldots\ldots$ to n terms.

ix. How many diagonals can be drawn in a plane figure with 8 sides?

x. Prove that $2^n > n \;\forall\; n \in N$.

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 $y = \frac{1}{2^1} + \frac{1.3}{2!}\cdot\frac{1}{2^2} + \frac{1.3.5}{3!}\cdot\frac{1}{2^3} + \ldots\ldots$, 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 ΔABC where $\alpha = 18.4^\circ$, $b = 154ft$, $c = 211ft$.

ii. Find a vector of magnitude 10 & perpendicular to $\vec{a} = 2\hat{i} - 3\hat{j} + 4\hat{k}$, $\vec{b} = 4\hat{i} - 2\hat{j} - 4\hat{k}$.