Sig. of Supdt.

KT-XI-14(A)

MATHEMATICS - (Part-I)

Roll No.

Fic. No.....

Fic. No.....

Time Allowed : 3 Hrs. **Total Marks : 100**

Note: There are three sections of this paper, A, B, & C. Carefully read the instructions for each section and attempt accordingly.

Time Allowed : 20 Mins. **SECTION – A** **Total Marks : 20**

Note: Use this sheet for this section. No. mark will be awarded for cutting, erasing or over writing.

Q. 1 Insert the correct option (a, b, c, d) in the empty box opposite to each part. Each part carries one mark. Any kind of Mark Left / Written is strictly prohibited. Mobile Phone is strictly prohibited in Examination Hall.

i) In 1832,..... Was the 1st Mathematician who gave the concept of complex numbers.

(a) Raphson (b) Jean Robert Argand (c) Newton (d) None

ii) The ordered pair (0,1) is called the .....

(a) Additive Identity (b) Imaginary unit (c) Multiplicative identity (d) None

iii) If a square matrix A has two Identical rows (columns), then det (A) =.....

(a) 0 (b) -1 (c) 1 (d) None

iv) A matrix having m rows and n columns with m = n, then the matrix A is called.....

(a) Singular matrix (b) Scalar matrix (c) Rectangular matrix (d) None

v) If a and b are two non-zero vectors then area of parallelogram is = ...

(a) |a x b| (b) $\frac{1}{2}|a \times b|$ (c) a x b (d) None

vi) If two vectors a and b are parallel and in opposite direction then the angle between them is

(a) 180° (b) 360° (c) 0° (d) 90°

vii) If a,b,c are the three edges of a tetrahedron, then its volume is

(a) $\frac{1}{3}[a.(b \times c)]$ (b) $\frac{1}{6}[a.(b \times c)]$ (c) a.(bxc) (d) None

viii) A harmonic sequence is the reciprocal of the ..... sequence.

(a) Quadratic (b) Cubic (c) Geometric (d) Arithmetic

ix) If a and b are two unit vectors then Cos θ = ...

(a) $\overline{a}.\overline{b}$ (b) $\overline{a} \times \overline{b}$ (c) ab (d) None

x) The set of all possible outcomes of a random experiment is called a .....

(a) Permutation (b) Combination (c) Sequence (d) Sample Space

xi) $C_r^n r!$ = ...

(a) P_r^n (b) P_r^{n-1} (c) **n!** (d) None

xii) The general term in the expansion of $(a+b)^n$ is T_{r+1} = ...

(a) $\binom{n}{r}a^{n-r}b^r$ (b) $\binom{n}{r}a^r b^{n-r}$ (c) $\binom{n}{r}a^r b^r$ (d) None

xiii) In the expansion of $(a+b)^n$, if n is odd then the middle term can be

(a) Two (b) Three (c) One (d) None

xiv) The middle term in the expansion of $\left(\frac{a}{x}+\frac{x}{a}\right)^{10}$ is .....

(a) 7th (b) 8th (c) 5th (d) 6th

xv) If α, β and γ are the direction angles then $Cos^2\alpha + Cos^2\beta + Cos^2\gamma$ = ...

(a) 1 (b) -1 (c) 0 (d) None

xvi) A function $f(x)$ is said to be even function if $f(-x)$ = ...

(a) $-f(x)$ (b) $f^{-1}(x)$ (c) $f(x)$ (d) None

xvii) The linear inequalities that are involved in the problem are called.....

(a) Problem constraints (b) Feasible solution (c) Feasible region (d) None

xviii) $\text{Cos}\ (\pi+\theta)$= .....

(a) - Cos θ (b) - Sin θ (c) Cos θ (d) Sin θ

xix) The Circumradius of a triangle ABC is

(a) r_1 (b) r_2 (c) r (d) R

xx) $\text{Sin}^{-1}(1)$ = ...

(a) $\frac{\pi}{4}$ (b) $\frac{\pi}{6}$ (c) $\frac{\pi}{2}$ (d) $\frac{\pi}{3}$

KT-XI-14(A)

MATHEMATICS - (Part-I)

Time Allowed : 2:40 Hrs. **Section – B** Total Marks : 80

Marks : 50

Note : Mobile Phone is strictly banned in Examination Hall.

Q. 2 Attempt any ten parts.

(i) For all $Z_1, Z_2 \in C$, prove that $\overline{Z_1 Z_2} = \overline{Z_1}\,\overline{Z_2}$

(ii) Verify that $(AB)^{-1} = B^{-1} A^{-1}$ if $A = \begin{bmatrix} 2 & 3 \\ 1 & 0 \end{bmatrix} B = \begin{bmatrix} -1 & 1 \\ 2 & 3 \end{bmatrix}$

(iii) Find the unit vector in the same direction as the vector $3\hat{i} - 2\hat{j}$.

(iv) Find the sum of all the integers lying between 100 and 600 that end in 5.

(v) Insert three arithmetic means between 6 and 41.

(vi) Prove by the fundamental principle of counting that $P_r^n = n\left(p_{r-1}^{n-1}\right)$

(vii) Establish the formula $1^3+2^3+3^3+\ldots\ldots n^3 = \left[\frac{n(n+1)}{2}\right]^2$ by Mathematical induction.

(viii) If $2y = \frac{1}{2^2} + \frac{1.3}{2!}\cdot\frac{1}{2^4} + \frac{1.3.5}{3!}\cdot\frac{1}{2^6} + \ldots\ldots$ then $y^2+2y-1 = 0$

(ix) Sketch the graph of function $f(x) = x^2 + 2x + 1$

(x) Graph the feasible region subject to the following constraints and also find the corner points.

$x + y \geq 3$
$2x + 3y \leq 12$
$x - y \leq 12$
$x \geq 0$
$y \geq 0$

(xi) Prove that $\tan 2\beta + Sec2\beta = \frac{Cos\beta + Sin\beta}{Cos\beta - Sin\beta}$

(xii) Show that $\sqrt{rr_1r_2r_3} = \Delta =$ area of triangle ABC.

(xiii) Draw the graph of $y = \text{Sec } x$, $0 \leq x \leq 2\pi$.

Section – C

Marks : 30

NOTE: - Attempt any three questions of the following. All questions carrying equal marks.

Q. 3 a) Determine Whether $1 + 2i$ is a solution of $Z^2 - 2Z + 5 = 0$

b) Reduce to the echelon form $\begin{bmatrix} 1 & 3 & -1 \\ 2 & 1 & 4 \\ 3 & 4 & -5 \end{bmatrix}$

Q. 4 a) Find the direction cosines of the vector from P(4,8, -3) to Q (-1,6,2)

b) Show that the sequence $\{a_n\} = 2^{-n}$ is geometric and find its common ratio.

Q. 5 a) Prove that $C_r^n + C_{r-1}^n = C_r^{n+1}$

b) Expand $\left(\frac{3}{2}x - \frac{3}{x^2}\right)^6$

Q. 6 a) Prove that $\text{Cos}\beta + \text{Cos}2\beta + \text{Cos}5\beta = \text{Cos}2\beta\ (1+2\cos 3\beta)$

b) Use the law of cosines to prove that $1 - Cos\alpha = \frac{(a-b+c)(a+b-c)}{2bc}$