Sig. of Supdt. ....

KT-XI-1501
MATHEMATICS
(Part – I)
(Fresh / New Course)

Roll No. ....

Fic. # ....

Fic. # ....

Total Marks: 100

MATHEMATICS
(Part – I)
(Fresh / New Course)

Time Allowed : 3 Hrs.

Marks: 20

Section "A"

Time : 20 Mins.

NOTE : Section-A is compulsory. All parts of this section to be answered on the questions paper itself. It should be completed in the given time and handed over to the Centre Superintendent. Deleting / Overwriting is not allowed. Do not use lead pencil.

NOTE : Insert the correct option (a, b, c, d) in the empty box opposite to each part.

Q. 1 Insert the correct option (a, b, c, d) in the empty box opposite to each part. Each part carries one mark.

i) Which property does not hold by the set of complex numbers? d
(a) Commutative (b) Associative (c) Closure (d) Order

ii) Degree 'n' of the polynomial $P_n(x)$ is ....integer. c
(a) Positive (b) Negative (c) Non-negative (d) Non-positive

iii) A square matrix $A = [A_{ij}]$ of order n is said to be .... if $A^t = A$. a
(a) Symmetric (b) Skew symmetric (c) Triangular (d) None of these

iv) A square matrix A is said to be singular if .... a
(a) $|A| = 0$ (b) $|A| \neq 0$ (c) $|A| < 0$ (d) $|A| > 0$

v) Direction of zero vector is .... a
(a) Arbitrary (b) x-axis (c) y-axis (d) z-axis

vi) Sum of the squares of direction cosines of a vector is .... b
(a) Zero (b) 1 (c) –1 (d) 2

vii) The medians of a triangle intersect each other in the ratio of c
(a) 1 : 2 (b) 2 : 3 (c) 2 : 1 (d) 3 : 2

viii) Domain of a sequence is .... a
(a) N (b) IR (c) Z (d) W

ix) If $|r| < 1$ then sum of infinite geometric series is .... d
(a) $\frac{a(1-r^n)}{1-r}$ (b) $\frac{a(r^n-1)}{r-1}$ (c) $\frac{a}{r-1}$ (d) $\frac{a}{1-r}$

x) $\frac{6!}{2!3!}$ = ... c
(a) 1 (b) ${}^6C_2$ (c) 60 (d) ${}^6C_3$

xi) If A & B are independent events then $P(A \cap B)$ = ... d
(a) $\frac{P(A)}{P(B)}$ (b) $P\left(\frac{A}{B}\right)$ (c) $P(A \cup B)$ (d) $P(A).P(B)$

xii) Number of terms in expansion of $(a + b)^6$ is .... b
(a) 8 (b) 9 (c) 7 (d) Infinite

xiii) The binomial series convergent only if in $(1 + x)^n$ c
(a) $|x| = 1$ (b) $|x| > 1$ (c) $|x| < 1$ (d) X is arbitrary

xiv) $\cos\left(\alpha + \frac{\pi}{2}\right)$ = ... a
(a) $-\sin\alpha$ (b) $\sin\alpha$ (c) $-\cos\alpha$ (d) $\cos\alpha$

xv) $\sin(\pi + \theta)$ = ... b
(a) $\sin\theta$ (b) $-\sin\theta$ (c) $\cos\theta$ (d) $-\cos\theta$

xvi) For equilateral triangle $r : R : r_1$ = ... b
(a) 3 : 2 : 1 (b) 1 : 2 : 3 (c) 2 : 1 : 3 (d) 3 : 1 : 2

xvii) For triangle ABC inscribed(incentre) r = ... b
(a) $\frac{abc}{4\Delta}$ (b) $\frac{\Delta}{S}$ (c) $\frac{\Delta}{S-a}$ (d) $\frac{\Delta}{S-b}$

xviii) Which one is even function? c
(a) sin x (b) cosec x (c) sec x (d) tan x

xix) Period of sin x is c
(a) $\frac{\pi}{2}$ (b) π (c) 2π (d) 4π

xx) If $\sin\theta$ is negative and $\cos\theta$ is positive then θ lies in quadrant .... d
(a) I (b) II (c) III (d) IV

KT-XI-1501

Y-408

MATHEMATICS

(Part – I)

(Fresh / New Course)

Total Marks : 80

Time Allowed : 2:40 Hrs.

Section – B

Marks : 50

Q. 2 Write short answers of any TEN of the following parts. Each part carries equal marks.

(i) Find the multiplicative inverse of $Z = -2-3i$

(ii) Factorize $P(Z) = 3Z^2 + 7$

(iii) If $A = \begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix}$ show that $(A^{-1})^{-1} = A$

(iv) For $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$ show that $(AB)^t = B^t A^t$

(v) If $\vec{r} = \hat{i} - 9\hat{j}$, $\vec{a} = \hat{i} + 2\hat{j}$ & $\vec{b} = 5\hat{i} - \hat{j}$ determine x and y such that $\vec{r} = x\vec{a} + y\vec{b}$.

(vi) Which term of the Arithmetic sequence 4, 1, –2, ... is 77.

(vii) Find 'n' such that ${}^{n}C_{2} = 36$

(viii) Expand upto four terms the series $(1-x)^{-\frac{1}{2}}$.

(ix) Show that the function $f(x) = 2x + 5$ is neither even nor odd function.

(x) Graph the inequality $x - 2y \geq 4$.

(xi) Prove that $\sin\theta = 2\sin\frac{\theta}{2}\cos\frac{\theta}{2}$.

(xii) Show that $\sin 5\theta + 2\sin 3\theta + \sin\theta = 4\sin 3\theta.\cos^2\theta$.

(xiii) Solve the ΔABC if $a = 209$, $b = 120$, $c = 241$

Section – C

Marks : 30

NOTE : Attempt any THREE questions. Each question carries equal marks.

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

b) Find 'λ' such that the system has non-trivial solution.

$$x + 5y + 3z = 0$$
$$5x + y - \lambda z = 0$$
$$x + 2y + \lambda z = 0$$

Q. 4 a) If $y = \frac{x}{3} + \frac{x^2}{3^2} + \frac{x^3}{3^3} + \ldots\ldots$ where $0 < x < 3$ then show that $x = \frac{3y}{1+y}$

b) Show that the sum of the first 'n' positive odd integers is n^2.

Q. 5 a) Prove by the mathematical induction that for all $n \in N$ $1+2+3\ldots\ldots+n = \frac{n(n+1)}{2}$.

b) Find the term independent for x in $\left(\frac{3}{2}x^2 - \frac{1}{3x}\right)^9$.

Q. 6 a) Show that $\frac{\sin(\alpha+\beta)}{\cos\alpha\cos\beta} = \tan\alpha + \tan\beta$

b) prove that $\frac{\sin 9\alpha + \sin\alpha}{\cos 9\alpha + \cos\alpha} = \tan 5\alpha$.