MODEL PAPER OF MATHEMATICS FOR GRADE-11
FOR (ANNUAL EXAM-2027)

Objective Type

Time Allowed: 30 Minutes **Maximum Marks: 20**

1. Note: Four possible answers A, B, C and D to each question are given. The choice which you think is correct, fill that circle with marker or ink pen in the answer-book. Cutting or filling two or more circles will result in zero mark in that question.

i.	The multiplicative identity in complex number is: (A) (1, 1) (B) (0, 0) (C) (1, 0) (D) (0, 1)
ii.	The sum of all the three cube roots of unity is: (A) 1 (B) 2 (C) 3 (D) 0
iii.	The domain of the function $f(x)=\sqrt{4-x^2}$ is: (A) $(-2, 2)$ (B) $(-2, \infty)$ (C) $(-\infty, 2)$ (D) $[-2, 2]$
iv.	What is the maximum value of $f(x) = -2x^2 + 4x + 3$? (A) 1 (B) 3 (C) 5 (D) 7
v.	If order of a matrix A is $m\times n$ and order of matrix B is $n \times p$ then order of AB is: (A) $n\times p$ (B) $m\times n$ (C) $m\times p$ (D) $p\times n$
vi.	If C is a matrix of order is 3×3 and $k \in R$ is any scalar then $\lvert kC\rvert$ is equal: (A) $k\lvert C^3\rvert$ (B) $k^3\lvert C^3\rvert$ (C) $k^3\lvert C\rvert$ (D) $(kC)^3$
vii.	An expression of the form $\frac{p(x)}{q(x)}$, $q(x)\neq 0$ is called: (A) Partial fraction (B) Rational fraction (C) Irrational fraction (D) Polynomial
viii.	The Arithmetic mean between $3\sqrt{3}$ and $\sqrt{3}$ is: (A) 4 (B) $4\sqrt{3}$ (C) $2\sqrt{3}$ (D) $\sqrt{3}$
ix.	The next term of the sequence 1, 3, 9, 27,… is: (A) 30 (B) 60 (C) 81 (D) 99
x.	0! is equal to (A) 0 (B) 1 (C) 2 (D) 3
xi.	The number of diagonals of 6-sided figure is: (A) 9 (B) 18 (C) 20 (D) 35
xii.	The remainder when $f(x)=x^4+x^3+x^2+1$ is divided by $x + 1$is: (A) 1 (B) 2 (C) 3 (D) 4
xiii.	$\text{Cos}\,ec\left(\frac{\pi}{2}+\alpha\right)$ is equal to: (A) $\cos\alpha$ (B) $\sin\alpha$ (C) $\sec\alpha$ (D) $\cos ec\alpha$

xiv.	The value of $\cos\left(\frac{\pi}{2}+\frac{\pi}{6}\right)$ is: (A) $-\frac{1}{5}$ (B) $\frac{1}{2}$ (C) $-\frac{1}{2}$ (D) $\frac{\sqrt{3}}{2}$
xv.	The range of $y = tan(x)$ *is*: (A) $(-\infty,0)$ (B) $(-\infty,\infty)$ (C) $(-\infty,-1)\cup(1,\infty)$ (D) $(-1,1)$
xvi.	$\lim_{x\to a} x^p$ is equal to: (A) p (B) a (C) p^a (D) a^p
xvii.	The notation used by Newton to denote derivative of $y = f(x)$ is: (A) $\frac{dy}{dx}$ (B) $\dot{f}(x)$ (C) $f'(x)$ (D) $Df(x)$
xviii.	The derivative of $f(x) = x^2 - 3$ at $x=2$? (A) 4 (B) 2 (C) 3 (D) 5
xix.	What will be the angle between the vector p and q, if $p.q = \frac{3}{5}$ and $\lvert p \times q\rvert = \frac{3}{5}$ is: (A) 30° (B) 45° (C) 60° (D) 90°
xx.	The magnitude of a vector perpendicular to both the vectors $u = 2i-3j+k$ and $v = i+4j-2k$ is: (A) $\sqrt{50}$ (B) $\sqrt{150}$ (C) $\sqrt{500}$ (D) $\sqrt{1550}$

Subjective Type (Part-I)

Time allowed: 2:30 hours **Max. Marks:80**

2. Write short answers to any EIGHT (8) questions: **2 × 8 = 16**

(i) If $z_1 = (4, 2)$ and $z_2 = (3,-1)$, then find $\frac{z_1}{z_2}$.

(ii) Show that: $i^{n+1} + i^{n+2} + i^{n+3} + i^{n+4} = 0$, for all $n \in N$.

(iii) Find the square root of complex number $5 + 12i$.

(iv) If ω is an imaginary cube roots of unity, prove that $\frac{a+b\omega^2+c\omega}{a\omega^2+b\omega+c} = \omega$

(v) Given $f(x) = x^3 - ax^2 + bx + 1$. If $f(2) = -3$ and $f(-1) = 0$. Find the values of a and b.

(vi) Find the domain and range of $f(x) = \sqrt{x^2-9}$.

(vii) Find the inverse of $f(x) = 3x^2 - 2x + 6, \quad x \geq 5.$

(viii) Solve $\lvert x^2+1\rvert = 5$

(ix) If A and B are square matrices of the same order, then explain why in general $(A+B)^2 \neq A^2 + 2AB + B^2$.

(x) Find the values of x if $\begin{vmatrix} 2 & 1 & x \\ -1 & -4 & -3 \\ x & 1 & 0 \end{vmatrix} = 5$

(xi) If A is a square matrix of order 3, then show that $|kA| = k^3 |A|$.

(xii) Resolve $\frac{2}{x^2 - 1}$ into partial fractions:

3. Write short answers to any EGHT (08) questions: **2 × 8 = 16**

(i) Which term of the A.P., 3, 8, 13, … is 123?

(ii) Find the sum of the first 100 positive integers.

(iii) Find the 12^{th} term of $1 + i$, $2i$, $-2 + 2i$, ⋯.

(iv) If 5 is the harmonic mean between 2 and b, find b.

(v) Evaluate $\frac{9!}{6!\,3!}$

(vi) How many signals can be given by 6 flags of different colours, using 2 flags at a time?

(vii) How any diagonals and triangles can be formed by joining the vertices of a the polygon having 15 sides?

(viii) When the polynomial $4x^4 + 2x^3 + kx^2 + 13$ is divided by $x + 1$, the remainder is 16. Find the value of k.

(ix) Suppose a polynomial regression model $P(x) = 3x^3 - 4x^2 + 2x - 5$. If a data point at $x = -1$ is missing. What should be its predicted value?

(x) Prove that : $\sin 210° + \cos 240° + \tan 225° + \cot 225° = 1$.

(xi) Prove that: $\cos(\alpha + 45°) = \frac{1}{\sqrt{2}}(\cos\alpha - \sin\alpha)$.

(xii) Express $\sin 5x + \sin 7x$ as a product.

4. Write short answers to any NINE (09) questions: **2 × 9 = 18**

(i) Find the periods of $\frac{1}{2}\sin\left(\frac{3x}{2} - \frac{\pi}{2}\right)$.

(ii) Find the maximum and minimum values of $\frac{3}{2} + \cos\left(x - \frac{\pi}{4}\right)$.

(iii) Evaluate $\lim_{x \to 3} \frac{x-3}{\sqrt{x} - \sqrt{3}}$.

(iv) Evaluate $\lim_{n \to +\infty} \left(1 + \frac{4}{n}\right)^n$

(v) Define divergent sequence.

(vi) A particle moves along a line such that its position after t hours is given by: $s(t) = 4t^2 + 2t + 1$(in miles). Find the average velocity over the interval [2, 5].

(vii) Find the gradient of the curve $f(x) = 3x^2 + 2x$ at $x = 1$.

(viii) Find the derivative of $y = \frac{3}{4}x^4 + \frac{2}{3}x^3 + \frac{1}{2}x^2 + 2x + 5$ w.r.t. x.

(ix) Differentiate $\frac{2x-3}{2x+1}$ w.r.t 'x'.

(x) If $\underline{u} = 2\underline{i} + 3\underline{j} + \underline{k}$, $\underline{v} = 4\underline{i} + 6\underline{j} + 2\underline{k}$ *and* $\underline{w} = -6\underline{i} - 9\underline{j} - 3\underline{k}$, then show that $\underline{u}, \underline{v}$ *and* $\underline{w}$ are parallel to each other.

(xi) Find t, so that $\left|2\underline{i} + (t-1)\underline{j} + t\underline{k}\right| = \sqrt{13}$

(xii) Find the work done, if the point at which the constant force $\underline{F} = 2\underline{i} + 5\underline{j} + 3\underline{k}$ is applied to an object, moves it from $P_1(2, -3, 1)$ to $P_2(7, 5, 3)$.

(xiii) Show that $\left|\underline{a} \times \underline{b}\right|^2 = \left|\underline{a}\right|^2 \left|\underline{b}\right|^2 - \left(\underline{a} \cdot \underline{b}\right)^2$

Subjective (Part-II)

Note: Attempt any three questions. **3 × 10 = 30**

5. (a) If $z_1 = x + yi$ and $z_2 = a + bi$, find x, y, a and b such that $z_1 + z_2 = 10 + 4i$ and $z_1 - z_2 = 6 + 2i$. **5**

(b) Solve $\left|x^2 - 3x + 2\right| > 4$ **5**

6. (a) Show that $\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix} = (a+b+c)^3$ **5**

(b) Resolve $\frac{x^2 - 10x + 13}{(x-1)(x^2 - 5x + 6)}$ into partial fractions. **5**

7. (a) For what value of n, $\frac{a^n + b^n}{a^{n-1} + b^{n-1}}$ is the positive geometric mean between a and b? **5**

(b) How many numbers between 100 and 1000 can be formed by using digits 0, 1, 2, 3, 4, 5 without repetition? How many of them are divisible by 5? **5**

8. (a) Prove that $\sin\frac{\pi}{9}\sin\frac{2\pi}{9}\sin\frac{\pi}{3}\sin\frac{4\pi}{9} = \frac{3}{16}$ **5**

(b) Given the function $f(x) = \begin{cases} 2x+3, & x \le 1 \\ -x+4, & x > 1 \end{cases}$

Discuss the limit and continuity at $x = 1$. **5**

9. (a) Differentiate $\frac{(\sqrt{x}+1)(x^{\frac{3}{2}} - 1)}{x^{\frac{3}{2}} - x^{\frac{1}{2}}}$ with respect to x. **5**

(b) If $\left|\underline{a}\right| = 3, \left|\underline{b}\right| = 4$ and $\left|\underline{a} + \underline{b}\right| = 5$. Find the angle between $\underline{a}$ and $\underline{b}$. **5**