Punjab Education, Curriculum, Training and Assessment Authority

SMART SYLLABUS / ACCELERATED LEARNING PROGRAMME (ALP)-DELETED TOPICS AND EXERCISE QUESTIONS OF MATHEMATICS-11

To facilitate students, the content of Mathematics-11 has been rationalized and reduced from the compulsory textbook. This rationalization aims to help students focus on the key Student Learning Outcomes (SLOs) that are essential for conceptual understanding and examination preparation, rather than covering the entire textbook. The unit-wise Smart Syllabus (ALP) is provided below. It clearly specifies the exercises, examples, and questions excluded from Mathematics-11 for the BISE Annual Examination-2027. Teachers and students are advised to follow this Smart Syllabus (ALP) for effective teaching, learning, and exam preparation.

Name of the Unit	Excluded Content & Questions of Mathematics-11
1 **Complex Numbers**	• 1.4.1 The Polar Form of a Complex Number, Operations on Complex Numbers in Polar Form, Examples 12 to 16; Pages # 15 to 18. • 1.5 Complex Numbers in the Real World, Examples 17 & 18; Pages # 19 to 20. • Exercise # 1.5: Q # 2 to Q # 22; Pages # 20 to 21.
2 **Functions and Graphs**	• 2.5 Real Life Applications, Examples 12 & 13; Pages # 31 to 32. • Exercise # 2.2: Q # 4 & Q # 5; Page # 33.
3 **Theory of Quadratic Functions**	• 3.5 Real World Problems of Quadratic Equations and Inequalities, Examples 9 & 10; Pages # 41 to 42. • Exercise # 3.2, Q # 2 to Q # 7; Page # 43.
4 **Matrices and Determinants**	• 4.6 Elementary Row Operation on a Matrix; Page # 61 • 4.7 Echelon and Reduced Echelon Form of Matrices, Examples 8 to 10; Pages # 62 to 64. • 4.8 System of Non-Homogeneous Linear Equations, Example # 11; Pages # 64 to 67. • 4.9 System of Homogeneous Linear Equations, Examples 14 & 15; Pages # 71 to 74. • 4.10 Applications of Matrices in Real World, Examples 16 & 17; Pages # 74 to 76. • Exercise # 4.3: Q # 1, 2, 5, 6, 7, 8, 9, 10 & 11; Pages # 76 to 77.

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5 **Partial Fractions**	• **Complete unit is retained. No content and questions are deleted / excluded.**
6 **Sequences and Series**	• Exercise # 6.2: Q # 20, 21, 22 & 23; Page # 94. • Exercise # 6.3: Q # 6; Page # 95. • Exercise # 6.4: Q # 17, 18 & 19; Page # 99. • Exercise # 6.5: Q # 7, 8, 9, 10 & 14; Page # 102. • Exercise # 6.6: Q # 7 & 8; Page # 104. • Exercise # 6.7: Q # 6; Page # 105. • 6.8 Arithmetico-Geometric Progression, Example 19, Examples 20 & 21; Pages # 106 to 109. • Exercise # 6.8 (Complete); Pages # 109 to 110. • Exercise # 6.9: Q # 13, 14, 15, 16, 17 & 18; Page # 114. • 6.11 Real Life Problems involving Sequences and Series, Examples 27 to 31; Pages # 117 to 120. • Exercise # 6.11 (Complete); Pages # 121 to 122.
7 **Permutations and Combinations**	• Exercise # 7.2: Q # 6, 9 & 11; Page # 129. • Exercise # 7.3: Q # 9, 10 & 11; Page # 132. • Exercise # 7.4: Q # 4, 5, 6, 17 & 18; Pages # 138 to 139.
8 **Mathematical Induction and Binomial Theorem**	**Complete unit is deleted / excluded.**
9 **Division of Polynomials**	• **Complete unit is retained. No content and questions are deleted / excluded.**
10 **Trigonometric Identities**	• 10.6 Triple Angle Identities, Pages # 192 to 193. • Exercise # 10.3, Q # 2 (viii, ix, x & xii), Q # 5; Pages # 194 to 195. • Exercise # 10.4, Q # 6, 7, 8, 9 &10; Page # 199.
11 **Trigonometric Functions and their Graphs**	• 11.4.1 Graph of Trigonometric Functions; Pages # 205 to 206. • 11.4.2 Graph of y = sin *x*; Pages # 206 to 207. • 11.4.3 Graph of y = cos *x*; Pages # 207 to 209. • 11.4.4 Graph of y = tan *x*; Pages # 209 to 210. • Exercise # 11.2 (Complete); Page # 211.

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12 **Limit and Continuity**	• 12.4 Application of Transcendental Functions to Limits and Continuity on Real World Problems, Examples 14 to 17; Pages # 234 to 235. • Exercise # 12.3 (Complete); Pages # 235 to 236.
13 **Differentiations**	• 13.7 Applications of Differentiation, Examples 12 to 15; Pages # 255 to 256. • Exercise # 13.3 (Complete); Pages # 256 to 257.
14 **Vectors in Space**	• Exercise # 14.1: Q # 9 & 10; Page # 266. • Exercise # 14.2: Q # 7, 8 & 12; Page # 274. • 14.4 Scalar Triple Product, Examples 23 to 31; Pages # 283 to 288. • Exercise # 14.4 (Complete); Pages # 289 to 290.

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INSTRUCTIONS FOR PREPARATION OF EXAM PAPER OF SMART SYLLABUS (ALP) OF MATHEMATICS GRADE-11 FOR ANNUAL EXAM-2027

The paper of Mathematics for Grade-11 will carry 100 marks.

Objective Type = 20 + Subjective Type = 80 marks.

Timing of the paper will be 3 hours.

(Objective Type = 30 minutes + Subjective Type = 2:30 hours)

All questions will be selected from the entire content of Mathematics-11 textbook. The paper will be made as per following details:

<table>
<tr>
<td>Objective:</td>
<td>Q-1: 20 Multiple Choice Questions from entire content of the textbook. The detail is as follows:
<table>
<tr><th>Unit No.</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>9</th><th>10</th><th>11</th><th>12</th><th>13</th><th>14</th></tr>
<tr><td>No. of MCQs</td><td>2</td><td>1</td><td>1</td><td>2</td><td>1</td><td>2</td><td>2</td><td>1</td><td>2</td><td>1</td><td>1</td><td>2</td><td>2</td></tr>
</table>
</td>
<td>1 × 20 = 20</td>
</tr>
<tr>
<td rowspan="3">Part-I:
Subjective:</td>
<td>This section contains three short questions from entire content of the textbook. The details are as follows:
Q-2: 8 short answer questions have to be answered out of 12. The detail is as follows:
<table>
<tr><th>Unit No.</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th></tr>
<tr><td>No. of Short Questions per unit</td><td>4</td><td>2</td><td>2</td><td>3</td><td>1</td></tr>
</table>
</td>
<td>2 × 8 = 16</td>
</tr>
<tr>
<td>Q-3: 8 short answer questions have to be answered out of 12. The detail is as follows:
<table>
<tr><th>Unit No.</th><th>6</th><th>7</th><th>9</th><th>10</th></tr>
<tr><td>No. of Short Questions per unit</td><td>4</td><td>3</td><td>2</td><td>3</td></tr>
</table>
</td>
<td>2 × 8 = 16</td>
</tr>
<tr>
<td>Q-4: 9 short answer questions have to be answered out of 13. The detail is as follows:
<table>
<tr><th>Unit No.</th><th>11</th><th>12</th><th>13</th><th>14</th></tr>
<tr><td>No. of Short Questions per unit</td><td>2</td><td>3</td><td>4</td><td>4</td></tr>
</table>
</td>
<td>2 × 9 = 18</td>
</tr>
</table>

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Part-II: **Subjective:**	This section contains five long questions from the entire content of the textbook. Each question carries 10 marks. These questions will be bifurcated in two-parts **a & b** (carrying 5 marks each). Students must attempt any three questions. The details are as follows: **Q-5:** **(a)** One long question will be asked from unit 1. **(b)** One long question will be asked either from unit 2 or unit 3. **Q-6:** **(a)** One long question will be asked from unit 4. **(b)** One long question will be asked either from unit 5 or unit 9. **Q-7:** **(a)** One long question will be asked from unit 6. **(b)** One long question will be asked from unit 7. **Q-8:** **(a)** One long question will be asked from unit 10. **(b)** One long question will be asked from unit 12. **Q-9:** **(a)** One long question will be asked from unit 13. **(b)** One long question will be asked from unit 14.	**3 × (5 + 5) = 30**

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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) $\cos ec\alpha$

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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 $(A+B)^2 \neq A^2 + 2AB + B^2$.

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(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 $1 + i, 2i, -2 + 2i, \cdots$.

(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.

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(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**

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