

INSTRUCTIONS: i) SECTION ‘B’ and SECTION ‘C’ must be solved on provided E-Sheet (Examination Copy).
ii) Student are instructed to write their answers on page allocated for the respective question number.
iii) All notations are used in their usual meanings. The use of scientific calculator is allowed.

SECTION ‘B’ (SHORT-ANSWER QUESTIONS) (Marks: 40)

NOTE: Answer **All part questions** from this section. All part questions carry equal marks.

2. i) Attempt either part (a), or part (b).

a) Write the following polynomial as the product of linear factors $z^3 - 3z^2 + 4z - 2$.

b) Find real and imaginary parts of $\left(\frac{3i-2}{2-3i}\right)^{-2}$

ii) Determine whether the following matrix is idempotent or involutory.

$$\begin{bmatrix} -1 & 2 & 4 \\ 1 & -2 & -4 \\ -1 & 2 & 4 \end{bmatrix}$$

iii) Applying the properties of determinant, prove that.

$$\begin{vmatrix} b+c & a & a \\ b & c+a & b \\ c & c & a+b \end{vmatrix} = 4abc$$

iv) A force of $22N$ is applied to the end of 0.15 meter wrench at an angle of 75 degrees with the axis of rotation. Calculate the magnitude of the moment $\vec{M}_o$ produced by applied force.

v) Attempt either part (a), or part (b).

a) If the sum of first and sixth terms of H.P. is $\frac{31}{116}$. Find the harmonic sequence, if the first term is $\frac{1}{4}$.

b) Find the sum of the series $\sum_{k=2}^n \frac{1}{(k^2 - k)}$

vi) Attempt either part (a), or part (b).

a) Find the vulgar fraction equivalent to $0.\dot{2}5\dot{9}$

b) Without using graph paper, sketch the graph of the function $y = f(x) = x^2 + 4x + 5$.

vii) How many diagonals and triangles can be drawn in a plane by joining the vertices of the polygon having 8 sides?

viii) Attempt either part (a), or part (b).

a) Prove the following proposition by mathematical induction. $7^n - 4^n$ is divisible by 3.

b) Show that: $\frac{\cos 8^\circ - \sin 8^\circ}{\cos 8^\circ + \sin 8^\circ} = \tan 37^\circ$

ix) Attempt either part (a), or part (b).

a) Evaluate without using calculator

$$\cos 1^\circ + \cos 2^\circ + \cos 3^\circ + \dots + \cos 180^\circ.$$

b) Find the general solution of the trigonometric equation $4\cos^2 x - 8\sin x + 1 = 0$.

x) Attempt either part (a), or part (b).

a) Find the measure of the largest angle in the triangle ABC with $a = 10cm$, $b = 20cm$ and $c = 26cm$.

b) Show the $\cos^{-1}\left(\frac{63}{65}\right) + 2\tan^{-1}\left(\frac{1}{5}\right) = \cos^{-1}\left(\frac{4}{5}\right)$

SECTION ‘C’ (DETAILED-ANSWER QUESTIONS) (Marks : 40)

NOTE: Answer **All** questions from this Section. All questions carry equal marks.

3. Attempt either part (a), or part (b).

a) Solve the non-homogenous system of linear equation using Gauss Jordan method:

$$2x + 2y - z = 4 \quad x - 2y + z = 2 \quad x + y = 0$$

b) Find the inverse of the matrix $A = \begin{bmatrix} 2 & 5 & -1 \\ 3 & 4 & 2 \\ 1 & 2 & -2 \end{bmatrix}$ by using row operations.

4. A bag contains 8 white, 10 black and 12 red balls. 3 balls are drawn from the bag. What is the probability that the first ball is white, the second ball is black and third ball is red, when every time the ball is replace?

5. Attempt either part (a), or part (b).

a) Given that the points $(1, 1)$, $(5, 4)$, $(8, 9)$ and $(0, 3)$ represent position vectors of A, B, C and D respectively. By using vector notations, show that $ABCD$ is a trapezium.

b) If $x = \frac{1}{3} + \frac{1.3}{3.6} + \frac{1.3.5}{3.6.9} + \frac{1.3.5.7}{3.6.9.12} + \dots$, prove that $x^2 + 2x - 2 = 0$.

6. Attempt either part (a), or part (b).

a) Find the equation of the function of the type $y = f(x) = ax^2 + bx + c$ which cuts the x-axis at the points $(-4, 0)$ and $(3, 0)$ also passes through the point $(2, -4)$.

b) Prove that: $\sin \frac{\alpha}{2} = \sqrt{\frac{(s-b)(s-c)}{bc}}$.

7. Attempt either part (a), or part (b).

a) Solve the following LP programming problem by graphical method when $x \geq 0, y \geq 0$.

$$\text{Maximize the objection function } z = f(x, y) = 30x + 36y,$$

$$\text{Subject to the constraints } 4x + 2y \leq 12; 6x + 5y \leq 20.$$

b) By using a graph, find the solution of the trigonometric equation $\tan x - \frac{4x}{\pi} = 0$

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BOARD OF INTERMEDIATE EDUCATION, KARACHI**INTERMEDIATE EXAMINATION****MODEL PAPER 2026****MATHEMATICS PAPER – I**

Max. Marks:20

(Pre –Engineering and Science General Groups)

Time: 20 Minutes

SECTION ‘A’ (MULTIPLE CHOICE QUESTIONS) – (M.C.Qs.)**(Marks : 20)****NOTE:**

- This section consists of 20 part questions and all are to be answered. Each part question carries one mark.
- This Section ‘A’ of Multiple Choice Question (MCQs) must be solved on the **MCQs/OMR sheet** enclosed on the last page of provided **E-Sheet & OMR** (Examination Copy).
- The correct answer bubble must be filled on MCQs / OMR sheet 1) ☐ A ☐ B ☐ C ☐ D
- Use only blue / black ball point on MCQs / OMR sheet.
- Avoid pencil / White-o pen / correction pen / ink remover and gel pen to solve the question on MCQs / OMR sheet.
- All notations are used in their usual meanings. The use of Scientific Calculator is allowed.

1. Choose the correct answer for each from the given options:

- The modulus of a complex number $z = a + ib$ represents the distance from a point (a, b) to:
 - $(-a, 0)$
 - $(0, 0)$
 - $(0, -b)$
 - $(1, 1)$
- If $i^n = 1$, the least value of n is::
 - 1
 - 2
 - 3
 - 4
- The periodic matrix having period 1, then the matrix is said to be:
 - idempotent
 - involutary
 - nilpotent
 - identity
- The determinant of a triangular matrix is the:
 - sum of main diagonal elements
 - product of main diagonal elements
 - sum of all non – zero elements
 - product of all non – zero elements
- If $|\vec{a}| = 10$, $|\vec{b}| = 2$ and $|\vec{a} \times \vec{b}| = 0$, then the value of $\vec{a} \cdot \vec{b} =$:
 - 0
 - 5
 - 12
 - 20
- The domain of a function must be the set of natural numbers then the function is called as a / an::
 - array
 - equation
 - sequence
 - ratio
- A sequence $\{a_n\}$, in which the ratios of every two consecutive terms are the same, is called::
 - A.P.
 - G.P.
 - H.P.
 - A.G.
- If $a_{n-2} = 3n - 11$, then $a_n =$:
 - $3n + 5$
 - $3n - 5$
 - $3n - 9$
 - $3n - 13$
- ${}^{19}P_4 =$:
 - $19! {}^{19}C_4$
 - $4! {}^{19}C_4$
 - $15! {}^{19}C_4$
 - $23! {}^{19}C_4$
- A die is rolled and $1 < x \leq 6$, then the probability of x is:
 - 0
 - 1
 - $\frac{3}{6}$
 - $\frac{5}{6}$
- The principle of mathematical induction is used to prove propositions for set of::
 - natural numbers
 - even numbers
 - integers
 - real numbers
- If $f : A \rightarrow B$ be a function, and it is the surjective, then:
 - Domain $\neq$ A
 - Domain = B
 - Range = A
 - Range = B
- The graph of linear function is a:
 - circle
 - straight Line
 - parabola
 - triangle
- Solution space of the linear inequality $\{x | x \in \mathbb{R} \wedge x > 5\}$ is also equal to:
 - $[5, \infty)$
 - $(-\infty, 5)$
 - $(5, \infty)$
 - $(-\infty, 5]$
- Solution space of a linear inequality $2x + 3y \leq 6, \forall x, y \in \mathbb{R}$, includes all points:
 - above the line
 - below the line
 - on and above the line
 - on and below the line
- If α, β and γ are the angles of ΔABC , then $\sin(\alpha + \beta) =$:
 - $-\sin \gamma$
 - $\sin \gamma$
 - $-\cos \gamma$
 - $\cos \gamma$

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MATHEMATICS PAPER – I
(Pre –Engineering and Science General Groups)

17. $2 \sin 7\theta \sin 2\theta =$
 A) $\cos 5\theta - \cos 9\theta$ B) $\cos 9\theta - \cos 5\theta$ C) $\sin 9\theta + \sin 5\theta$ D) $\sin 9\theta - \sin 5\theta$
18. In a ΔABC , $a + b =$
 A) $s + c$ B) $2(s + c)$ C) $2s - c$ D) $s + 2c$
19. If $y = \sec^{-1}x$, then the range is:
 A) $0 \leq y \leq \pi, y \neq \frac{\pi}{2}$ B) $0 < y < \pi$
 C) $-\frac{\pi}{2} \leq y \leq \frac{\pi}{2}, y \neq 0$ D) $-\frac{\pi}{2} < y < \frac{\pi}{2}$
20. If $\tan 2x = -1$ with the interval $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$, then the solution is:
 A) $x = -\frac{\pi}{4}$ B) $x = -\frac{\pi}{8}$ C) $x = \frac{3\pi}{4}$ D) $x = -\frac{3\pi}{8}$
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