

BOARD OF INTERMEDIATE EDUCATION, KARACHI

INTERMEDIATE EXAMINATION

MODEL PAPER 2026

MATHEMATICS PAPER – II

Max. Marks:80

(Pre-Engineering and Humanities Groups – Regular & Private)

Time: 2 Hours 40 Minutes

INSTRUCTION: The use of scientific calculator is allowed. All notations are used in their usual meanings.

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

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

2. i) Find the limit of $\lim_{x \rightarrow e} \frac{\ln x - 1}{x - e}$
- ii) Determine whether the function $f(x) = \begin{cases} 2 + x & \text{when } x < 3 \\ 5 - 2x & \text{when } x \geq 3 \end{cases}$ is continuous at $x = 3$
- iii) Find derivative of $f(x) = \frac{1}{\sqrt{x}}$ **OR** $f(x) = \tan x$ with respect to x by ab-initio/first principle method.
- iv) Find the first four terms of Maclaurin’s series of $f(x) = \ln(1+x)$
- v) Find the limit of the vector $\vec{r}(t) = (e^{3t} - 1)\hat{i} + \frac{\sqrt{3+t} - \sqrt{3}}{3t}j + \frac{1}{9t+1}k$ at $t = 0$
- vi) Find the area above the x-axis under the curve $y = \ln x$ between the ordinates $x = 1, x = 3$.
- vii) Evaluate by using properties $\int_{-2}^1 |x| dx$.
- viii) If a point $(k, 7)$ divide the line segment joining $A(8, 9)$ and $B(1, 2)$ in ratio $m : n$ then find ratio $m : n$ and also find k .
- ix) Find the equation of the perpendicular bisector of the segment joining $(-1, 2)$ and $(9, 12)$.
- x) Find equation of circle through the point $(1, 2), (2, 3)$ and having centre on y-axis.
- xi) Find equation of the conic whose focus is $(3, 0)$, directrix is $x - 5 = 0$ and $e = 1$. Also identify the conic.
- xii) Find new coordinates of point $P(2, 3)$ if xy–axes are rotated through an angle $\theta = 60^\circ$.
- xiii) Find the orthogonal trajectories of the curve $xy = c$.
- xiv) Find $\frac{\partial f}{\partial x}$ and $\frac{\partial f}{\partial y}$ for the function $f(x) = \sin(x + y)$.

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

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

3. Evaluate any two of the following integrals:

a) $\int x \sec^2 x \, dx$ b) $\int \frac{dx}{(x-3)(x^2+1)}$ c) $\int_0^2 \frac{dx}{\sqrt{16-x^2}}$

4. Evaluate $\frac{dy}{dx}$ any two of the following:

a) $y = \ln(1-x^2) + 2x \tanh^{-1} x$ b) $y = \sin^{-1}(\cos x) + \cos^{-1}(\sin x)$
 c) $x = 4(t - \sin t)$ and $y = 4(1 + \cos t)$

5. Find the maximum and minimum values of $f(x) = e^x \sin x$.
6. Find the equation of a line passing through the point $(3, 2)$ and making angle of 45° with the line $x - 2y = 3$.
7. Find Semi axes, eccentricity, foci, vertices, co vertices and equation of directrices for the curve:
 $9x^2 - 4y^2 + 36x + 8y - 4 = 0$
8. A resistor of 5 ohms and a capacitor of 0.02 farads are connected with 10 volt battery. Assume that initially charge on capacitor is 5 coulombs. Find the charge and current in the circuit at any time.

OR

Solve the deferential equation $\frac{dy}{dx} = \frac{x+2y-3}{2x+y-3}$

9. Evaluate the integral $\int_0^{\frac{\pi}{2}} \sin x \, dx$ with 7 intervals by using Trapezoidal rule.

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MATHEMATICS PAPER – II

Max. Marks:20

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Time: 20 Minutes

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

- i) This section consists of 20 part questions and all are to be answered. Each part question carries one mark.
 ii) Do not copy the part questions in your answerscript. Write only the answer in full against the proper number of the question and its part.
 iii) 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:

- i) This Maple the command used to evaluate π to 5 digits is:
 * $>\text{evalf}(\text{Pi}, 5);$ * $>\text{eval}(\text{Pi}, 5);$ * $>\text{expf}(\text{Pi}, 5);$ * $>\text{exp}(\text{Pi}, 5);$
- ii) This Maple command $> \text{Matrix}(2);$ returns?:
 * $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ * $\begin{bmatrix} 2 & 2 \\ 2 & 2 \end{bmatrix}$ * $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$ * $\begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}$
- iii) A function $f(x) = \frac{x}{|x|}$, $x \neq 0$ is an:
 * odd function * even function
 * odd and even both * neither odd nor even
- iv) $\lim_{x \rightarrow 0} (1+x)^{\frac{1}{x}} = :$
 * e * e^2 * e^x * $e^{\frac{1}{x}}$
- v) The derivative of $\coth^{-1}(2x)$ is:
 * $\frac{2}{1-4x^2}$ * $\frac{2x}{1-4x^2}$ * $\frac{2x}{1-4x^2}$ * $\frac{2}{1+4x^2}$
- vi) Let f is the function with rule $f(x) = \ln 2x$ and $(x > 0)$, if g is inverse of f , then:
 * $\frac{\ln x}{2}$ * $\frac{2}{\ln x}$ * $\frac{e^x}{2}$ * $\frac{2}{e^x}$
- vii) Second order derivative of $f(x) = A \sin x + B \cos x$ is:
 * $f(x)$ * $-f(x)$ * $\pm f(x)$ * $f'(x)$
- viii) The slope of tangent to the curve $x^{\frac{2}{3}} + y^{\frac{2}{3}} = 2$ at $(1, 1)$:
 * 0 * ± 1 * 1 * -1
- ix) Differentiation of a vector function $f(t) = (e^{2t} + 1)\hat{i} + \sin(2t)\hat{j} + t^2\hat{k}$ with respect to 't' at $t = 0$ is:
 * $2\hat{i} + 2\hat{j} + 3\hat{k}$ * $2\hat{j} + 3\hat{k}$ * $2\hat{i} + 3\hat{k}$ * $2\hat{i} + 2\hat{j}$
- x) $\int x^2 \ln e^{x^2} = :$
 * $\frac{x^2}{4} + c$ * $\frac{x^5}{5} + c$ * $\ln e^{x^2} + c$ * $\ln x^x + c$
- xi) $\int_{-a}^a f(x) dx =$ where $f(-x) = f(x)$ is:
 * $-2 \int_0^a f(x) dx$ * $\int_0^a f(x) dx$ * $-\int_0^a f(x) dx$ * $2 \int_0^a f(x) dx$
- xii) If the line coincides with x – axis then it equation is:
 * $y = b$ * $x = b$ * $y = 0$ * $x = 0$
- xiii) The point of intersection of points of line $ax^2 + 2hxy + by^2 = 0$:
 * (a, b) * $(a, 0)$ * $(0, 0)$ * $(0, b)$
- xiv) The line $y = 2x + c$ will be tangent to $x^2 + y^2 = 25$ if:
 * $c^2 = 25$ * $c^2 = 625$ * $c^2 = 50$ * $c^2 = 125$

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- xv) The eccentricity of a rectangular hyperbola is:
* $\pm\sqrt{2}i$ * $-\sqrt{2}$ * $\sqrt{2}$ * $\sqrt{2}i$
- xvi) The foci of the ellipse $9x^2 + 25y^2 = 225$ is:
* $(\pm 4, 0)$ * $(0, \pm 4)$ * $(\pm 16, 0)$ * $(0, \pm 16)$
- xvii) The general solution of the differential equation $\frac{dy}{dx} = -y$ is:
* $y = \ln x + c$ * $y = \ln xc$ * $\ln y = -x + c$ * $\ln y = x + c$
- xviii) The order and degree differential equation $\frac{d^2y}{dx^2} = \sqrt{1 + \left(\frac{dy}{dx}\right)^3}$ is:
* 2, 2 * 3, 2 * 2, 3 * 2, 1
- xix) Given that $g(x, y) = \cos\left(\frac{x}{y}\right)$ then $\frac{g_y}{g_x} = ?$:
* $-\frac{x}{y}$ * $\frac{x}{y}$ * $-\frac{x}{y^3}$ * $-\frac{y}{x}$
- xx) In Simpson $\frac{1}{3}$ method, the number of subinterval is the multiple:
* 4 * 1 * 2 * 3

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