Lahore Board Group I *(First Annual Examination 2025)*

Roll No. _____ (To be filled in by the candidate) (Academic Sessions 2021 - 2023 to 2023 - 2025)

MATHEMATICS 225-1st Annual-(INTER PART - II) Time Allowed : 30 Minutes

Q. Paper - II (Objective Type) Group - I Maximum Marks : 20

Paper Code = 8193

NOTE: Four possible answers A, B, C and D to each question are given. The choice which you think is correct, fill that circle in front of that question with Marker or Pen ink in the answers book. Cutting or filling two or more circles will result in zero mark in that question.

Q1.

1	The circle $x^2 + y^2 + 2gx + 2fy + c = 0$ having centre (0, 0) if: (A) $c = 0$ (B) $g = 0$ (C) $f = 0$ (D) $f = 0$ and $g = 0$
2	If the distance between $(0, -2)$ and $(0, x)$ is 1, then $x =$ _____: (A) –3 (B) –2 (C) 3 (D) 0
3	If $2i + \alpha j + 5k$ and $3i + j + \alpha k$ are perpendicular, then $\alpha =$ _____: (A) 0 (B) 1 (C) –1 (D) 2
4	Which one of the following is a feacible solution of the inequality $3x + 7y \leq 21$: (A) (1, 1) (B) (1, –1) (C) (–2, 2) (D) (3, –1)
5	$2i \cdot j \times 3k =$ _____: (A) 0 (B) 6 (C) 1 (D) 3
6	The point of intersection of the lines $x - 2 = 0$ and $y - x = 0$ is _____: (A) (2, 0) (B) (0, –2) (C) (2, –2) (D) (2, 2)
7	If $v = -i + 2j + 2k$, then the projectiion of j along v is _____: (A) $\frac{2}{3}$ (B) 2 (C) $-\frac{1}{3}$ (D) 3
8	The radius of the circle $x^2 + y^2 = 48$ is _____: (A) $3\sqrt{3}$ (B) $4\sqrt{3}$ (C) $8\sqrt{3}$ (D) 48
9	If the slope of the line joining (0, 1) and (1, y) is 1,then $y =$ _____: (A) –1 (B) 0 (C) 1 (D) 2
10	The directrix of the parabola $x^2 = -8y$ is _____: (A) $x + 2 = 0$ (B) $x - 2 = 0$ (C) $y + 2 = 0$ (D) $y - 2 = 0$
11	If $f(x) = e^{\tan x}$, then $f'\left(\frac{\pi}{4}\right) =$ _____: (A) 0 (B) e (C) 2e (D) ℓne
12	If x is the length of each side of a cube, then the area of its base is _____: (A) x (B) x^2 (C) x^3 (D) $4x$
13	$\int_{-1}^{0} \lvert x \rvert dx =$ _____: (A) $-\frac{1}{2}$ (B) $\frac{1}{2}$ (C) 1 (D) 0
14	The derivative of x^2 w.r.t. $2x$ is: (A) x (B) $2x$ (C) 1 (D) 2
15	$\int \ell nx dx$ (A) $\frac{1}{x} + c$ (B) $x(\ell nx + 1) + c$ (C) $\ell nx - x + c$ (D) $x(\ell nx - 1) + c$
16	The second order derivative of $\sin 3x$ w.r.t. x is: (A) $-9 \sin 3x$ (B) $9 \sin 3x$ (C) $9 \cos 3x$ (D) $-9 \cos 3x$
17	$\frac{d^3y}{dx^3} + \left(\frac{d^2y}{dx^2}\right)^2 + x = 0$ is of _____ order differential equation: (A) First (B) Second (C) Third (D) Fourth
18	If $f(x) = \frac{1}{\sqrt{x}}$, then $f^{-1}(x) =$ _____: (A) $\frac{1}{\sqrt{x}}$ (B) $\frac{1}{x}$ (C) $\sqrt{x}$ (D) $\frac{1}{x^2}$
19	For $y = \ell nx$, the differential of y is equal to: (A) $\frac{1}{x}$ (B) $\frac{dx}{x}$ (C) xdx (D) 0
20	If $f(x) = x^2 - 4x$ and $f'(x) = 0$, then what is the value of x: (A) 1 (B) 2 (C) 3 (D) 4

Roll No. _____ (To be filled in by the candidate) (Academic Sessions 2021 - 2023 to 2023 - 2025)

MATHEMATICS 225-1st Annual-(INTER PART - II) Time Allowed: 2.30 hours

PAPER - II (Essay Type) Group - I Maximum Marks: 80

SECTION - I

Q2. Write short answers to any EIGHT (8) questions: 16

(i) Determine whether the given function $f(x) = \frac{x^3 - x}{x^2 + 1}$ is even or odd. (ii) Find $fog(x)$ and $gof(x)$ for the real valued functions defined as $f(x) = \sqrt{x+1}$, $g(x) = \frac{1}{x^2}$, $x \neq 0$ (iii) Evaluate $\lim_{x \to 2} \frac{\sqrt{x} - \sqrt{2}}{x - 2}$ (iv) Find $\frac{f(a+h) - f(a)}{h}$ and simplify, where $f(x) = \sin x$. (v) If $f(x) = \begin{cases} x+2, & x \leq -1 \\ c+2, & x > -1 \end{cases}$, find "c" so that $\lim_{x \to -1} f(x)$ exists. (vi) Find the derivative of $y = \left(2\sqrt{x} + 2\right)\left(x - \sqrt{x}\right)$ with respect to x. (vii) If $x = 1 - t^2$ and $y = 3t^2 - 2t^3$ find $\frac{dy}{dx}$. (viii) Differentiate $\cos\sqrt{x} + \sqrt{\sin x}$ w.r.t: x (ix) Differentiate $y = e^{f(x)}$ w.r.t. x (x) Examine the function defined as $f(x) = 1 + x^3$ for extreme values. (xi) Prove that $e^{x+h} = e^x \left\{1 + h + \frac{h^2}{|2} + \frac{h^3}{|3} + - - - -\right\}$ (xii) Find y_2, if $x = a\cos\theta$, $y = a\sin\theta$

Q3. Write short answers to any EIGHT (8) questions: 16

(i) Use differentials to find $\frac{dy}{dx}$ and $\frac{dx}{dy}$ in the equation $x^2 + 2y^2 = 16$ (ii) Evaluate $\int \frac{adt}{2\sqrt{at+b}}$, $at + b > 0$ (iii) Find $\int x\, e^x\, dx$ (iv) Evaluate $\int x \sin x\, dx$ (v) Evaluate the definite integral $\int_1^{\sqrt{3}} \sqrt{(2t-1)^3}\, dt$ (vi) Find the area between the x-axis and the curve $y = x^2 + 1$ from $x=1$ to $x=2$ (vii) Solve the differential equation $xdy + y(x - 1)dx = 0$ (viii) The two points P and O' are given in xy-coordinate system. Find xy-coordinates of P referred to the translated axes O'X and O'Y . P(3, 2) ; O'(1, 3) (ix) Find the slope and inclination of the line joining the points (–2, 4) ; (5, 11) (x) By considering the area of the region bounded by the triangle with vertices A(1, 4), b(2, – 3) and C(3, – 10). Check whether the three points are collinear or not. (xi) Find an equation of the line throught A(– 6, 5) having slope 7 (xii) Express the system $3x + 4y - 7 = 0$, $2x - 5y + 8 = 0$, $x + y - 3 = 0$ in matrix form and check whether three line are concurent.

Q4. Write short answers to any NINE (9) questions: 18

(i) Define obejective function. (ii) Indicate the solution region by shading the inequality $2x + 3y \leq 12$ (iii) Find the length of tangent drawn from the point (–5, 4) to $5x^2 + 5y^2 - 10x + 15y - 131 = 0$ (iv) Find foci and vertex of $y^2 = -8(x - 3)$ (v) Write an equation of parabola with focus (– 1, 0), vertex (– 1, 2) (vi) Give definition of a circle. (vii) Find centre and eccentricity of hyperbola $\frac{y^2}{16} - \frac{x^2}{9} = 1$ (viii) Find a unit vector of $\bar{v} = \frac{1}{2}\hat{i} + \frac{\sqrt{3}}{2}\hat{j}$ (ix) Find the direction cosines of the vector $\bar{v} = 6\hat{i} - 2\hat{j} + \hat{k}$ (x) Find the cosine of the angle θ between $\bar{u} = \hat{i} - 3\hat{j} + 4\hat{k}$ and $\bar{v} = 4\hat{i} - \hat{j} + 3\hat{k}$ (xi) Calculate projection of $\underline{a}$ along $\underline{b}$ if $\underline{a} = \hat{i} - \hat{k}$, $\underline{b} = \hat{j} + \hat{k}$ (xii) Compute $\underline{a} \times \underline{b}$ if $\underline{a} = -4\hat{i} + \hat{j} - 2\hat{k}$ and $\underline{b} = 2\hat{i} + \hat{j} + \hat{k}$ (xiii) Find the value of $\left[\hat{i}\ \hat{i}\ \hat{k}\right]$

SECTION - II

Note: Attempt any THREE questions.

Q5. (a) Find the value of m and n, so that the function $f(x) = \begin{cases} mx & \text{if } x < 3 \\ n & \text{if } x = 3 \\ -2x + 9 & \text{if } x > 3 \end{cases}$ is continuous at $x = 3$ 5

(b) Prove that $y\frac{dy}{dx} + x = 0$ if $x = \frac{1 - t^2}{1 + t^2}$ and $y = \frac{2t}{1 + t^2}$ 5

Q6. (a) If $y = \cos^{-1} x)^2$, show that $(1 - x^2)\, y_2 - xy_1 - 2 = 0$ **(b)** Evaluate $\int \sqrt{x^2 + 4}\, dx$ 5, 5

Q7. (a) Find the area between x-axis and the curve $y = \sqrt{2ax - x^2}$ 5

(b) Graph the feasible region of the system of linear inequalities $3x + 2y \geq 6$; $x + y \leq 4$; $x \geq 0$, $y \geq 0$ Also find the corner points. 5

Q8. (a) Write an equation of circle that passes through the given points A(4, 5), B(–4, –3), C(8, –3) 5

(b) Find an equation f the perpendicular bisector of the segment joining the points A(3, 5) and B(9, 8) 5

Q9. (a) For any point on a hyperbola the difference of its distance from the points (2, 2) and (10, 2) is 6. Find an equation of the hyperbola. 5

(b) Prove that teh angle in a semi circle is a right angle. 5

Note: For Answers of long questions please study "Hamdard Notes Mathematics" Class 12.