Faisalabad Board Group-II *(First Annual Examination 2025)*

Objective | **Intermediate Part Second** | **Roll No. _____**

Paper Code | **MATHEMATICS (Objective) Group - II**

8196 | **Time: 30 Minutes** | **Marks: 20**

Note: You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill the relevant circle in front of that question number on computerized answer sheet. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question. Attempt as many question as given in objective types question paper and leave other circle blank.

Q1.

S.#	Questions	A	B	C	D
1	$y = cx$ is the solution of the differential equation:	$\frac{dy}{dx} = x$	$\frac{dy}{dx} = -y$	$\frac{dy}{dx} = c$	$c\frac{dy}{dx} = 1$
2	$\int_0^{\pi} \sin x\,dx =$:	-2	-1	0	2
3	$\int \frac{1}{a^2+x^2}dx =$:	$\tan^{-1}\frac{x}{a}+c$	$\tan^{-1}\frac{a}{x}+c$	$\frac{1}{a}\tan^{-1}\frac{d}{x}+c$	$\frac{1}{a}\tan^{-1}\frac{a}{x}+c$
4	$\int \frac{2}{x}dx =$:	$\ell nx + c$	$-\frac{2}{x^2}+c$	ℓnx^2+c	$-\ell nx^2+c$
5	If $y = e^{2x}$, then $\frac{dy}{dx} =$:	$2e^{2x}$	e^{2x}	$-2e^{2x}$	$-e^{2x}$
6	$\frac{d}{dx}\left(\ell n\frac{e}{x}\right) =$:	x/e	$1+1/x$	$1/x - 1$	$-1/x$
7	The derivative of x^4 w.r.t x^2 is:	x	$4x^3$	$2x^2$	$2x$
8	If $f(x) = ax^2 + bx + c$ and $f'(x) = 0$, then what is the value of x:	$a/2b$	$-b/2a$	$2a/b$	$2b/a$
9	$\lim_{x\to 0} e^{1/x}$ = _____ when $x<0$:	0	1	e	∞
10	The function $f(x) = \tan x$ is a/an:	Even	Odd	Linear	Identity
11	$\underline{i} \cdot \underline{j} \times \underline{i} =$:	$\underline{k}$	0	$\underline{i}$	1
12	The projection of $\underline{i}$ along $\underline{k}$ is:	0	1	$\underline{i}$	$-\underline{i}$
13	The magnitude of a vector $2\underline{i}-\underline{j}-2\underline{k}$=:	1	2	3	4
14	The axis of parabola $x^2 = -16y$ is:	$x = 0$	$y = 0$	$x + 4 = 0$	$y - 4 = 0$
15	If (1,1) lies outside the circle $x^2+y^2+x+y+c=0$, then:	$c = -4$	$c < -4$	$c > -4$	$c = -5$
16	The radius of the circle $x^2+y^2=12$ is:	12	$2\sqrt{3}$	$3\sqrt{2}$	$3\sqrt{3}$
17	Which is a feasible solution of $x+y\leq 2$?	(0,–1)	(–1, 0)	(1,1)	(–1, –1)
18	The distance of the point (2,3) from the y-axis is:	0	2	3	5
19	If the slope of line joining (2,0) and (x,1) is 1 then x will be:	–3	–1	1	3
20	If (2,–1) is a mid-point of line joining (2,3) and (2,y) then y = :	–3	–4	1	–5

Intermediate Part Second
MATHEMATICS (Subjective) Group - II
Time 02:30 Hours Marks: 80
Roll No. _____

SECTION - I

Q2. Attempt any EIGHT parts: 16

(i) Without finding the inverse, state the domian and range of $f^{-1}(x)$ where $f(x) = (x-5)^2$, $x \geq 5$.

(ii) Evaluate: $\lim_{x\to 3} \frac{x-3}{\sqrt{x}-\sqrt{3}}$ (iii) Evaluate the limit by using algebraic techniques: $\lim_{x\to 2} \frac{\sqrt{x}-\sqrt{2}}{x-2}$

(iv) Define an even function. Also give its example. (v) Show that the parametric equations $x = a\cos t$ and $y = a\sin t$ represents the equation of circle $x^2+y^2 = a^2$ (vi) Differentiate w.r.t. x $(x-5)(3-x)$.(vii) Find the derivative of $y = \frac{3}{4}x^4 + \frac{2}{3}x^3 + \frac{1}{2}x^2 + 2x + 5$ (viii) Find $\frac{dy}{dx}$ If $x^2 + y^2 = 4$ (ix) Prove that $(\cot x) = -\operatorname{cosec}^2 x$.

(x) Differentiate $\sin^3 x$ w.r.t $\cos^2 x$ (xi) Differentiate w.r.t x $\cos^{-1}\left(\frac{x}{a}\right)$ (xii) Differentiate $y = a^x$ w.r.t x

Q3. Attempt any EIGHT parts: 16

(i) Evaluate $\int (3x^2 - 2x + 1)dx$ (ii) Integrate $\int \frac{-2x}{\sqrt{4-x^2}}dx$ (iii) Find the integral $\int x\sin x\,dx$ (iv) Find $\int x e^x dx$

(v) Evaluate $\int_{-1}^{3} (x^3 + 3x^2)dx$ (vi) Find $\int x\cos x\,dx$ (vii)Find the area between the x-axis and the curve $y = x^2+1$ from x=1 to x=2.(viii) Find the distance between two points A(3,1) and B (–2,–4)(ix) Find the mid-point of the line joining points A(–8,3) and B(2,–1).(x) Find the slope and inelination of line joining (–2, 4) and (5,11) (xi) Write an equation of vertical line through (–5, 3 (xii) Check whether two lines are parallel $2x+y-3 = 0$, $4x + 2y + 5 = 0$

Q4. Attempt any NINE parts: 18

(i) Define (a) Corner point (b) Linear inequality.(ii) Graph the solution set of linear inequality $3x + 7y \geq 21$ (iii) Find the center and radius of the circle $x^2 + y^2 + 12x - 10y = 0$(iv) Find the vertex and directrix of the parabola $x^2 = 5y$(v) Find the equation of ellipse having center at (0,0) focus at (0,–3) and one vertex at (0,4)

(vi) Find eccentricity of the hyperbola $\frac{y^2}{16} - \frac{x^2}{49} = 1$ (vii) Find the length of tangent from point (–5, 4) to circle $5x^2+5y^2-10x+15y-131 = 0$ (viii) If $\underline{u}=2\underline{i}-7\underline{j}$, $\underline{v} = \underline{i} - 6\underline{j}$, $\underline{w} = -\underline{i} + \underline{j}$, find the vector $2\underline{u} - 3\underline{v} + 4\underline{w}$.
(ix) Find the direction cosines of vector $\overrightarrow{PQ}$, where P(2,1,5) and Q (1,3,1) (x) Define parallel vectors.
(xi) Find the volume of parallelopiped determined by $\underline{u}=\underline{i}+2\underline{j}-\underline{k}$, $\underline{v}=\underline{i}-2\underline{j}+3\underline{k}$, $\underline{w}=\underline{i}-7\underline{j}-4\underline{k}$ (xii) If $\underline{a}=3\underline{i}-2\underline{j}+\underline{k}$, $\underline{b} = \underline{i} + \underline{j}$, compute $\underline{a} \times \underline{b}$ (xiii) If $\underline{u} = 2\underline{i} + 3\underline{j} + \underline{k}$, $\underline{v} = 4\underline{i} + 6\underline{j} + 2\underline{k}$, $\underline{w} = -6\underline{i} - 9\underline{j} - 3\underline{k}$, then find $|\underline{u} - \underline{v} - \underline{w}|$

SECTION - II

Note: Attempt any THREE questions. Each question carries 10 marks.

Q5. (a) Discuss the continuity of f(x) $f(x) = \begin{cases} 3x-1 & \text{if } x<1 \\ 4 & \text{if } x=1 \\ 2x & \text{if } x>1 \end{cases}$ at $x = 1$ 5

(b) If $y = x^4 + 2x^2+2$ Prove that $\frac{dy}{dx} = 4x\sqrt{y-1}$ 5

Q6. (a) If $y = e^x \sin x$, show that $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 2y = 0$ 5

(b) Evaluate: $\int \frac{dx}{(1+x^2)^{3/2}}$ 5

Q7. (a) Minimize $z=3x+y$ subject to the constraints: $3x+5y\geq 15$, $x+6y\geq 9$, $x\geq 0$, $y\geq 0$. 5

(b) Evaluate the integral $\int_{-1}^{5} |x-3|\,dx$ 5

Q8. (a) Show that the circles $x^2 + y^2 + 2x - 8 = 0$ and $x^2 + y^2 - 6x + 6y - 46 = 0$ touch internally. 5

(b) Find the equation of the line through (–4, 7) and parallel to the line $2x - 7y + 4 = 0$ 5

Q9. (a) Prove that $\sin(\alpha+\beta) = \sin\alpha - \cos\beta + \cos\alpha\sin\beta$ 5

(b) Find equations of the tangents of the ellipse $\frac{x^2}{128} + \frac{y^2}{18}$ which are parallel to the line $3x+8y+1=0$. Also find point of contact. 5