Bahawalpur Board-2024

Mathematics	(A)	L.K.No. 1468	Paper Code No. 8191
Paper II	(Objective Type)	Inter (I[st] – A – Exam 2024)	
Time :	30 Minutes	Inter (Part - II)	Session (2020 – 22) to (2022 – 24)
Marks :	20		

Note : Four choices A, B, C, D to each question are given. Which choice is correct fill that circle in front of that Question No. on the Objective Bubble Sheet. Use Marker or Pen to fill the circles. Cutting or filling two or more circles will result in Zero Mark in that Question.

Q.No	
1 (1)	A function of the form f (x , y) = 0 is called : (A) Parametric Function (B) Identity Function (C) Explicit Function (D) Implicit Function
(2)	$\frac{e^{2x}-1}{2e^x}$ = : (A) Sinx (B) Cos x (C) Sinhx (D) Coshx
(3)	$\lim_{x\to a}\frac{f(x)-f(a)}{x-a}$ is equal to : (A) f ′(x) (B) f ′(0) (C) f ′(a) (D) f ′(2)
(4)	$\frac{d}{dx}\left(\frac{1}{ax+b}\right)$ is equal to : (A) $\frac{1}{(ax+b)^2}$ (B) $\frac{-a}{(ax+b)^2}$ (C) $\frac{a}{(ax+b)^2}$ (D) ln (ax + b)
(5)	Derivative of $\sin^2 x$ with respect to $\cos^2 x$ is : (A) −1 (B) 1 (C) tanx (D) cotx
(6)	Derivative of $\sinh^{-1} x$ with respect to x is : (A) $\frac{1}{\sqrt{1-x^2}}$ (B) $\frac{1}{\sqrt{1+x^2}}$ (C) $\frac{-1}{\sqrt{1-x^2}}$ (D) $\frac{-1}{\sqrt{1+x^2}}$
(7)	For n ≠ −1 , $\int x^n\,dx$ = : (A) $\frac{x^{n-1}}{n-1}+C$ (B) $x^{n+1}+C$ (C) $\frac{x^{n+1}}{n+1}+C$ (D) $\frac{x^n}{n+1}+C$
(8)	$\int Sec^2 nx\,dx$ = : (A) $\frac{n}{3}$ sec nx + c (B) n tan nx + c (C) tan nx + c (D) $\frac{1}{n}$ tan nx + c
(9)	When expression $\sqrt{x^2-a^2}$ involve in integration , we substitute : (A) x = asecθ (B) x = asinθ (C) x = atanθ (D) x = sinθ
(10)	$\int_{-\infty}^{\infty}\frac{1}{1+x^2}dx$ = : (A) $\frac{\pi}{2}$ (B) π (C) $\frac{\pi}{4}$ (D) $\frac{\pi}{3}$
(11)	If Distance of point (5 , x) from x – axis is 3 then x = : (A) 7 (B) 5 (C) 3 (D) – 5
(12)	If ‘α’ is inclination of line ‘ℓ’ then it must be true that : (A) $0\le\alpha<\frac{\pi}{2}$ (B) $\frac{\pi}{2}\le\alpha<\pi$ (C) $0\le\alpha\le 2\pi$ (D) $0<\alpha<\pi$
(13)	If lines are parallel then point of intersections are : (A) Does not exist (B) Finite (C) Infinite (D) Both B and C
(14)	A Feasible Solution which maximize or minimize the objective function is called : (A) Solution (B) Optimal Solution (C) Minimum Solution (D) Maximum Solution
(15)	Axis of Parabola x^2 = 4ay is : (A) y = 0 (B) x = y (C) x = 0 (D) y = –x
(16)	Length of major and minor axis of ellipse $x^2+16y^2=16$ is : (A) 4 , 1 (B) 10 , 5 (C) 16 , 2 (D) 8 , 2
(17)	If eccentricity e > 1 then the conic is : (A) Hyperbola (B) Ellipse (C) Circle (D) Parabola
(18)	Direction Cosines of y – axis are : (A) (1 , 0 , 0) (B) (0 , 1 , 0) (C) (0 , 0 , 1) (D) (0 , 0 , 0)
(19)	$\lvert \underline{a} \times \underline{b} \rvert$ = : (A) Area of Triangle (B) Area of Circle (C) Area of Parallelogram (D) Area of Trapezium
(20)	Projection of Vector $\underline{r} = a\hat{i}+b\hat{j}+c\hat{k}$ on x – axis is : (A) a (B) b (C) c (D) $\sqrt{a^2+b^2+c^2}$

Roll No.	L.K. NO.1468– 20000	Inter (Part II)	Session (2020 –22) to (2022 – 24)
Mathematics (Subjective)	Inter (I[st] – A – Exam 2024)		Time 2 : 30 Hours Marks : 80

Note : It is compulsory to attempt any (8 – 8) Parts each from Q.No. 2 and Q.No.3 while attempt any (9) Parts from Q.No.4. Attempt any (3) Questions from Part – II .Write same Question No. and its Part No. as given in the Question Paper.

Part - I — 25 x 2 = 50

Q.No.2	(i)	Show that the Parametric Equations $x = at^2$, $y = 2at$ represent the Parabola $y^2 = 4ax$		
	(ii)	Evaluate $\lim\limits_{x \to -\infty} \frac{2-3x}{\sqrt{3+4x^2}}$		
	(iii)	Evaluate $\lim_{x\to\infty}\left(\frac{x}{1+x}\right)^x$		
	(iv)	Express the Perimeter " P " of a square as a function of its area A .	(v)	Differentiate $\frac{2x-3}{2x+1}$ with respect to x
	(vi)	Differentiate $x^2 \sec 4x$ w.r.t the variable involved.	(vii)	Find $\frac{dy}{dx}$ if : $4x^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$
	(viii)	Find $\frac{dy}{dx}$ if $x = at^2$ and $y = 2at$	(ix)	Differentiate $\ln(x^2 + 2x)$ w.r.t. ' x '
	(x)	Find y_2 if $y = \ln\left(\frac{2x+3}{3x+2}\right)$	(xi)	Expand a^x in the Maclaurin Series.
	(xii)	Find extreme values of $f(x) = 3x^2$		
Q.No.3	(i)	Find δy if $y = \sqrt{x}$ when ' x ' changes from 4 to 4.41	(ii)	Evaluate $\int \frac{ax+b}{ax^2+2bx+c}\,dx$
	(iii)	Evaluate $\int \operatorname{Cosec} x\, dx$	(iv)	Evaluate $\int \tan^{-1} x\, dx$
	(v)	Evaluate $\int_{-1}^{1} (x^{1/3} + 1)\, dx$	(vi)	Find the area between the x-axis and the curve $y = 4x - x^2$
	(vii)	Solve the Differential Equation $\frac{dy}{dx} = \frac{1-x}{y}$		
	(viii)	Find the Coordinates of the point that divides the join of A (– 6 , 3) and B (5 , – 2) in the ratio 2 : 3 externally .		
	(ix)	The coordinates of a point ' P ' are (– 6 , 9) . The axes are translated through the point O′ (– 3 , 2). Find the Coordinates of ' P ' referred to the new axes.		
	(x)	Convert $4x + 7y - 2 = 0$ into intercept form.		
	(xi)	Find the point of intersection of the lines $x + 4y - 12 = 0$ and $x - 3y + 3 = 0$		
	(xii)	Find the lines represented by $6x^2 - 19xy + 15y^2 = 0$		
Q.No.4	(i)	Draw the graph of linear inequality $2x \geq -3$ in xy – plane.		
	(ii)	Define the Optimal Solution.		
	(iii)	Find the Centre and Radius of the circle $x^2 + y^2 - 6x + 4y + 13 = 0$		
	(iv)	Write down equations of Tangent to circle $x^2 + y^2 = 25$ at (4 , 3)		
	(v)	Define Circle.		
	(vi)	Find an equation of Ellipse having Centre at (0 , 0) , Focus at (0 , – 3) and One Vertex at (0 , 4) .		

P.T.O.

L.K.No. 1468

Bahawalpur Board-2024

	(vii)	Write equation of normal to the Parabola $x^2 = 16y$ at the point whose Abscissa is 8.
	(viii)	Find Centre and Vertices of conic $\frac{(y+2)^2}{9} - \frac{(x-2)^2}{16} = 1$
	(ix)	Find a vector whose magnitude is 2 and is parallel to $-\underline{i} + \underline{j} + \underline{k}$
	(x)	Calculate the projection of $\underline{b}$ along $\underline{a}$, when $\underline{a} = 3\underline{i} + \underline{j} - \underline{k}$, $\underline{b} = -2\underline{i} - \underline{j} + \underline{k}$
	(xi)	Find a vector perpendicular to each of the vectors $\underline{a} = 2\underline{i} + \underline{j} + \underline{k}$, $\underline{b} = 4\underline{i} + 2\underline{j} - \underline{k}$
	(xii)	Write Direction Cosines of a vector $\underline{r} = x\underline{i} + y\underline{j} + z\underline{k}$
	(xiii)	Find the volume of the parallelepiped determined by : $\underline{u} = \underline{i} - 2\underline{j} + 3\underline{k}$, $\underline{v} = 2\underline{i} - \underline{j} - \underline{k}$, $\underline{w} = \underline{j} + \underline{k}$

(Part – II) **3 x 10 = 30**

Q.No.5	(a)	If $f(x) = \begin{cases} 3x \text{ if } x \leq -2 \\ x^2 - 1 \text{ if } -2 < x < 2 \\ 3 \text{ if } x \geq 2 \end{cases}$ Discuss Continuity at x = 2 and x = – 2	(5)
	(b)	Show that $\frac{dy}{dx} = \frac{y}{x}$ if $\frac{y}{x} = \tan^{-1}\left(\frac{x}{y}\right)$	(5)
Q.No.6	(a)	If $y = (\cos^{-1} x)^2$, Prove that $(1 - x^2)\, y_2 - x y_1 - 2 = 0$	(5)
	(b)	Evaluate the integral $\int \sqrt{4 - 5x^2}\, dx$	(5)
Q.No.7	(a)	Evaluate $\int_0^{\pi/4} \cos^4 t\, dt$	(5)
	(b)	Maximize the function defined as ; $f(x, y) = 2x + 3y$ subject to constraints $2x + y \leq 8$; $x + 2y \leq 14$; $x \geq 0$; $y \geq 0$	(5)
Q.No.8	(a)	Find equation of the tangent drawn from (– 1 , 2) to $x^2 + y^2 + 4x + 2y = 0$	(5)
	(b)	Prove that Perpendicular Bisectors of the sides of a triangle are Concurrent	(5)
Q.No.9	(a)	Find the Centre, Foci, Eccentricity of Ellipse $x^2 + 16x + 4y^2 - 16y + 76 = 0$	(5)
	(b)	Find 'h' such that the points A (h , 1) , B (2 , 7) and C (– 6 , –7) are vertices of a Right Triangle with Right Angle at the vertex A.	(5)

PAPER CODE - 8193

MATHEMATICS | 12th CLASS – 1st Annual 2024 | TIME: 30 MINUTES
GROUP : FIRST | **OBJECTIVE** | MARKS: 20

DG Khan Board-2024

NOTE: You have four choices for each objective type question as A , B , C and D . The choice which you think is correct , fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero marks in that question.

QUESTION NO. 1

1	Derivative of $\sqrt{x}$ w.r.t. x at x = a is (A) $\sqrt{a}$ (B) $2\sqrt{a}$ (C) $\frac{1}{\sqrt{a}}$ (D) $\frac{1}{2\sqrt{a}}$
2	If $f(x) = x^{100}$, $f'(1) =$ (A) 0 (B) 50 (C) 99 (D) 100
3	$\int a^{\lambda x}\,dx =$ (A) $\frac{a^{\lambda x}}{\lambda} + c$ (B) $\frac{a^{\lambda x}}{\ln a} + c$ (C) $\frac{a^{\lambda x}}{\lambda \ln a} + c$ (D) $a^{\lambda x} . \ln a + c$
4	$\int e^x \left(\frac{1}{x} - \frac{1}{x^2}\right) dx =$ (A) $\frac{e^x}{x} + c$ (B) $-\frac{e^x}{x} + c$ (C) $e^x . \ln x + c$ (D) $-\frac{e^x}{x^2} + c$
5	$\int \frac{1}{x^2 + 16}\,dx =$ (A) $\tan^{-1}\left(\frac{x}{4}\right) + c$ (B) $\frac{1}{4}\tan^{-1}\left(\frac{x}{4}\right) + c$ (C) $\frac{1}{4}\tan\left(\frac{x}{4}\right) + c$ (D) $\frac{1}{2}\tan^{-1}\left(\frac{x}{4}\right) + c$
6	$\int 0\,dx =$ (A) 0 (B) 1 (C) x + c (D) constant
7	A line which pass through one vertex and mid-point of opposite side of a triangle is called (A) Median (B) Altitude (C) Normal (D) Perpendicular bisector
8	If A(- 2 , 3) , B(- 4 , 1) and C(3 , 5) are the vertices of a triangle , then its centroied is (A) $\left(\frac{-3}{2}, \frac{9}{2}\right)$ (B) (- 1 , 3) (C) (3 , 4) (D) (- 3 , 9)
9	If point (2 , - 9) lies on line px + y + 20 = 0 , then value of p is (A) $\frac{11}{2}$ (B) $\frac{-11}{2}$ (C) $\frac{29}{2}$ (D) $\frac{-29}{2}$
10	If x > b , then which one is correct ? (A) - x > - b (B) - x < b (C) x < b (D) - x < - b
11	The circle whose radius is 0 is called a/an (A) Unit circle (B) Imaginary circle (C) Point circle (D) Circum circle
12	The point (- 5 , 6) lies .... the circle $x^2 + y^2 = 61$ (A) Outside (B) Inside (C) On (D) Any where
13	The length of semi-latus rectum of hyperbola (A) 2a (B) $\frac{b^2}{2a}$ (C) $\frac{b^2}{a}$ (D) $\frac{2b^2}{a}$
14	Which of the following is not vector quantity (A) Weight (B) Momentum (C) Force (D) Energy
15	If vectors $\vec{a}$ and $\vec{b}$ have same direction , then $\vec{a} . \vec{b} =$ (A) ab (B) - ab (C) ab sinθ (D) $(ab)^2$
16	Value of $2\hat{\imath} \times 2\hat{\jmath} . \hat{k}$ is (A) 0 (B) 1 (C) 2 (D) 4
17	cosec hx is equal to .... (A) $\frac{2}{e^x + e^{-x}}$ (B) $\frac{1}{e^x + e^{-x}}$ (C) $\frac{2}{e^x - e^{-x}}$ (D) $\frac{2}{e^{-x} - e^x}$
18	f(x) = ax + b , a ≠ 0 is a/an (A) Linear function (B) Odd function (C) Even function (D) Identity function
19	Derivative of an identity function is (A) 0 (B) 1 (C) – 1 (D) Identity function
20	$x^3 \frac{d}{dx}(\ln 2x) =$ (A) x^2 (B) $2x^3$ (C) $3x^2$ (D) $6x^2$

GROUP : FIRST

SUBJECTIVE

SECTION-I

QUESTION NO. 2 Write short answers any Eight (8) of the following 16

i	Express perimeter 'p' of a square as a function of its area 'A'
ii	Without finding inverse state domain and range of f^{-1} if $f(x) = (x-5)^2$, $x \geq 5$
iii	Evaluate $\lim\limits_{x \to 1} \frac{x^2-1}{x^2-x}$
iv	Evaluate the limit $\lim\limits_{\theta \to 0} \frac{\sin^2\theta}{\theta}$
v	Differentiate with respect to 'x' $\frac{1}{x-a}$ by definition
vi	Differentiate with respect to 'x' $\frac{a+x}{a-x}$
vii	Find $\frac{dy}{dx}$ by making suitable substitution of $y = (3x^2 - 2x + 7)^6$
viii	Differentiate with respect to 'x' $\frac{1}{a}\sin^{-1}\left(\frac{a}{x}\right)$
ix	Differentiate $(\ln x)^x$ with respect to 'x'
x	Find y_2 if $x^2 + y^2 = a^2$
xi	Show that $\cos(x+h) = \cos x - h\sin x - \frac{h^2}{2!}\cos x + \frac{h^3}{3!}\sin x + \ldots\ldots\ldots\ldots$
xii	Find interval in which 'f' is increasing or decreasing $f(x) = \cos x$, $x \in \left(\frac{-\pi}{2}, \frac{\pi}{2}\right)$

QUESTION NO. 3 Write short answers any Eight (8) of the following 16

i	Find δy and dy of $y = x^2 - 1$, when x changes from 3 to 3.02
ii	Evaluate $\int \frac{(\sqrt{\theta}-1)^2}{\sqrt{\theta}}\, d\theta$
iii	Find the area between the x-axis and the curve $y = 4x - x^2$
iv	Solve the differential equation $\frac{dy}{dx} = \frac{y}{x^2}$, $(y > 0)$
v	Evaluate $\int_{-1}^{3} (x^3 + 3x^2)\, dx$
vi	Evaluate $\int x \ln x \, dx$
vii	Find $\int \frac{-2x}{\sqrt{4-x^2}}\, dx$
viii	Find distance between the points A(-8 , 3) ; B(2 , -1). Also find mid-point between them
ix	The coordinates of a point p are (- 6 , 9). The axes are translated through the point O′ (-3 , 2). Find the coordinates of P referred to the new axes
x	Show that points (- 4 , 6) ; (3 , 8) and (10 , 10) lie on the same line
xi	Find the distance from the point P(6 , -1) to the line $6x - 4y + 9 = 0$
xii	Find measure of the angle between the lines represented by $x^2 - xy - 6y^2 = 0$

QUESTION NO. 4 Write short answers any Nine (9) of the following 18

i	Graph the inequality $x + 3y > 6$
ii	Define feasible region and feasible solution
iii	Find the centre and radius of circle $x^2 + y^2 - 6x + 4y + 13 = 0$
iv	Find the slope of normal to the circle $x^2 + y^2 = 25$ at (4 , 3)
v	Check the position of the point (5 , 6) w.r.t circle $x^2 + y^2 = 81$
vi	Find the focus and directrix of parabola $x^2 = -16y$
vii	Find centre and foci of ellipse $25x^2 + 9y^2 = 225$
viii	Find eccentricity and vertices of $x^2 - y^2 = 9$
ix	Find a vector whose magnitude is 2 and is parallel to $-\underline{i} + \underline{j} + \underline{k}$
x	Find cosine of the angle between $\underline{u}$ and $\underline{v}$ where $\underline{u} = [-3, 5]$ and $\underline{v} = [6, -2]$
xi	Compute $\underline{a} \times \underline{b}$ and $\underline{b} \times \underline{a}$ if $\underline{a} = \underline{i} + \underline{j}$ and $\underline{b} = \underline{i} - \underline{j}$
xii	If $\underline{a} + \underline{b} + \underline{c} = 0$ then prove that $\underline{a} \times \underline{b} = \underline{b} \times \underline{c}$
xiii	Find the volume of the parallelepiped determined by $\underline{u} = \underline{i} + 2\underline{j} - \underline{k}$, $\underline{v} = \underline{i} - 2\underline{j} + 3\underline{k}$ and $\underline{w} = \underline{i} - 7\underline{j} - 4\underline{k}$

(P.T.O)

SECTION-II

ote: Attempt any Three questions from this section **10 x 3 = 30**

Q.5- (A)	Discuss continuity of f at x = 3, when $f(x) = \begin{cases} x-1 & if\ x<3 \\ 2x+1 & if\ x \geq 3 \end{cases}$
(B)	Prove that $y\frac{dy}{dx} + x = 0$ if $x = \frac{1-t^2}{1+t^2}$, $y = \frac{2t}{1+t^2}$
Q.6- (A)	If $y = (\cos^{-1} x)^2$, prove that $(1-x^2)\,y_2 - xy_1 - 2 = 0$
(B)	Evaluate : $\int \sqrt{4-5x^2}\ dx$
Q.7-(A)	Evaluate $\int_0^{\pi/4} \frac{\cos\theta + \sin\theta}{2\cos^2\theta}\, d\theta$
(B)	Maximize $f(x, y) = x + 3y$ subject to the constraints $2x + 5y \leq 30$; $5x + 4y \leq 20$; $x \geq 0$; $y \geq 0$
Q.8-(A)	Find equations of the tangents drawn from (0 , 5) to $x^2 + y^2 = 16$
(B)	Prove that $\sin(\alpha - \beta) = \sin\alpha\cos\beta - \cos\alpha\sin\beta$ using vectors
Q.9-(A)	Find centre , foci , eccentricity and directrices of hyperbola $\frac{x^2}{16} - \frac{y^2}{9} = 1$
(B)	Find equation of line through the intersection of $x - y - 4 = 0$ and $7x + y + 20 = 0$ and perpendicular to the line $6x + y - 14 = 0$

PAPER CODE - 8196

MATHEMATICS
GROUP : SECOND

12th CLASS – 1st Annual 2024
OBJECTIVE

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 that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero marks in that question.

QUESTION NO. 1

1	$\int e^x(\sin x - \cos x)\,dx = ?$ (A) $e^x \cos x + c$ (B) $e^x \sin x + c$ (C) $-e^x \cos x + c$ (D) $-e^x \sin x + c$
2	$\int_0^{1/2} \frac{1}{\sqrt{1-x^2}}\,dx = ?$ (A) $\frac{\pi}{6}$ (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{3}$ (D) $\frac{\pi}{2}$
3	The distance of a point P(2 , - 3) from the x – axis is equal to (A) - 3 (B) - 2 (C) 2 (D) 3
4	If (2 , 4) , (4 , 6) and (3 , 2) are the vertices of a triangle , then coordinates of the centroid are (A) (3 , 4) (B) (4 , 6) (C) $\left(\frac{9}{2}, 6\right)$ (D) (24 , 48)
5	The lines represented by $3x^2 - 5xy - 3y^2 = 0$ will be (A) Parallel (B) Perpendicular (C) Neither parallel nor perpendicular (D) Tangent lines
6	$x = 2$ is the solution of (A) $x > 1$ (B) $x < 5$ (C) $x > 7$ (D) $x > 9$
7	A chord which contains the centre of the circle is called (A) Radius (B) Focal chord (C) Diameter (D) Tangent line
8	The perpendicular at the outer end of a radial segment is .... to the circle (A) Secant (B) Normal (C) Perpendicular (D) Tangent
9	Asymptotes of the curve $\frac{x^2}{16} - \frac{y^2}{25} = 1$ are (A) $y = \pm\frac{5}{4}x$ (B) $y = \pm\frac{4}{5}x$ (C) $y = \frac{5}{4}\sqrt{x^2-16}$ (D) $y = -\frac{5}{4}\sqrt{x^2-16}$
10	Projection of a vector $\vec{b}$ along vector $\vec{a}$ is (A) $\frac{\vec{a}\cdot\vec{b}}{\lvert\vec{b}\rvert}$ (B) $\frac{\vec{a}\cdot\vec{b}}{\vec{b}}$ (C) $\frac{\vec{a}\cdot\vec{b}}{\vec{a}}$ (D) $\frac{\vec{a}\cdot\vec{b}}{\lvert\vec{a}\rvert}$
11	The value of $[\hat{k}\ \hat{i}\ \hat{j}] = ?$ (A) - 1 (B) 0 (C) 1 (D) 2
12	If three vectors $\vec{a}, \vec{b}$ and $\vec{c}$ are coplanar , then scalar triple product of these vectors is (A) a negative number (B) a positive number (C) a non-negative number (D) zero
13	$\lim_{x \to a} \frac{x^{n-1} - a^{n-1}}{x - a} = ?$ (A) na^{n-1} (B) $(n-1)a^{n-2}$ (C) na^{n-1} (D) $(n-1)a^{n-1}$
14	If $f(x) = 2 + \sqrt{x-1}$ $\forall x \in \mathbb{R}$, then domain of $f^{-1}(x)$ is (A) $[-1, +\infty)$ (B) $[0, +\infty)$ (C) $[1, +\infty)$ (D) $[2, +\infty)$
15	$\frac{d}{dx}\left(x - \frac{\sin 2x}{2}\right) = ?$ (A) $2\sin^2 x$ (B) $2\cos^2 x$ (C) $2\sin x$ (D) $2\cos x$
16	If $f(x) = \frac{1}{12}x^4$, then $f^{(4)}(x) = ?$ (A) 0 (B) 1 (C) 2 (D) 3
17	If $xy + y^2 = 2$, then $\frac{dy}{dx} = ?$ (A) $\frac{-x}{x+2y}$ (B) $\frac{-y}{x+2y}$ (C) $\frac{xy-y}{x+2y}$ (D) $\frac{x-2y}{x-y}$
18	If $f(x) = x^2 + 2x - 3$, then $f(x)$ is decreasing in the interval (A) $(-1, +\infty)$ (B) $(-\infty, -1)$ (C) $(-\infty, 1)$ (D) $(1, 3)$
19	$\int \frac{\sin x - \cos x}{\sqrt{1-\sin 2x}}\,dx = ?$ (A) $x + c$ (B) $\sin x + c$ (C) $\cos x + c$ (D) $\cos^2 x + c$
20	$\int \frac{x}{x+2}\,dx = ?$ (A) $x + \ln(x+2) + c$ (B) $x - \ln(x+2)^2 + c$ (C) $x - \ln(x+2) + c$ (D) $x + \ln(x+2)^2 + c$

GROUP : SECOND

SECTION-I

DG Khan Board-2024

QUESTION NO. 2 Write short answers any Eight (8) of the following 16

i	Express the perimeter P of a square as a function of its area A
ii	Find the values of (fog) and (gof) when $f(x) = 2x+1$, $g(x) = \frac{3}{x-1}$
iii	Evaluate $\lim_{x\to -1} \frac{x^3-x}{x+1}$
iv	Find c such that $\lim_{x\to -1} f(x)$ exist where $f(x) = \begin{cases} x+2, & x \le -1 \\ c+2, & x > -1 \end{cases}$
v	Find $\frac{dy}{dx}$ by definition when $y = 2x^2+1$
vi	Find $\frac{dy}{dx}$ when $y = \frac{2x-3}{2x+1}$
vii	If $x = \theta + \frac{1}{\theta}$ and $y = \theta+1$, find $\frac{dy}{dx}$
viii	Differentiate $\sin x$ w.r.t. $\cot x$
ix	If $y = x e^{\sin x}$, find $\frac{dy}{dx}$
x	Find y_2 when $x = at^2$, $y = bt^4$
xi	Find the extreme values of $f(x) = 3x^2$
xii	Find y_2 when $y = 2x^5 - 3x^4 + 4x^3 + x - 2$

QUESTION NO. 3 Write short answers any Eight (8) of the following 16

i	Use differentials to find $\frac{dy}{dx}$ and $\frac{dx}{dy}$ of $x^4 + y^2 = xy^2$
ii	Evaluate $\int \frac{(1-\sqrt{x})^2}{\sqrt{x}}\, dx$
iii	Evaluate $\int \frac{dx}{x^2+4x+13}$
iv	Evaluate $\int x^2 \tan^{-1} x\, dx$
v	Evaluate $\int \frac{(a-b)x}{(x-a)(x-b)}\, dx$
vi	Evaluate $\int_1^2 \frac{x^2+1}{x+1}\, dx$
vii	Solve the differential equation $\frac{dy}{dx} = \frac{1-x}{y}$
viii	Show that points A(-1, 2), B(7, 5) and C(2, -6) are vertices of right triangle
ix	In a triangle A(8, 6), B(-4, 2), C(-2, -6) find slope of any one median of triangle
x	Find the slopes of lines l_1 and l_2 where l_1: Joining (2, 7) and (7, 10) l_2: Joining (1, 1) and (-5, 3)
xi	Find the lines represented by $3x^2 + 7xy + 2y^2 = 0$
xii	Find the distance between parallel lines $2x + y + 2 = 0$, $6x + 3y - 8 = 0$

QUESTION NO. 4 Write short answers any Nine (9) of the following 18

i	Indicate the solution set of the system of linear inequalities $3x + 7y \ge 21$, $x - y \le 2$
ii	Define feasible region
iii	Find centre and radius of the circle $4x^2 + 4y^2 - 8x + 12y - 25 = 0$
iv	Find vertex and directrix of parabola $(x-1)^2 = 8(y+2)$
v	Define axis of parabola
vi	Find an equation of hyperbola with foci $(0, \pm 6)$ and $e = 2$
vii	Find centre and vertices of ellipse $25x^2 + 9y^2 = 225$
viii	Find equation of tangent to the conic $y^2 = 4ax$ at point (x_1, y_1)
ix	Find direction cosines of the vector $6\hat{i} - 2\hat{j} + \hat{k}$
x	If the vectors $\underline{u} = \alpha\underline{i} + 2\alpha\underline{j} - \underline{k}$ and $\underline{v} = \underline{i} + \alpha\underline{j} + 3\underline{k}$ are perpendicular. Find the value of α
xi	Define unit vector. Also give an example
xii	Find the value of α for which $\alpha\hat{i} + \hat{j}$, $\hat{i} + \hat{j} + 3\hat{k}$ and $2\hat{i} + \hat{j} - 2\hat{k}$ are coplanar
xiii	Define cross product of two vectors $\underline{u}$ and $\underline{v}$

(P.T.O)

DG Khan Board-2024

SECTION-II

Note: Attempt any Three questions from this section **10 x 3 = 30**

Q.5- (A)	Prove that $\lim_{x \to 0} \frac{a^x - 1}{x} = \log_e a$
(B)	If $x = a\cos^3\theta$, $y = b\sin^3\theta$, show that $a\frac{dy}{dx} + b\tan\theta = 0$
Q.6- (A)	If $y = e^x \sin x$, show that $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 2y = 0$
(B)	Evaluate : $\int \sqrt{a^2 + x^2}\ dx$
Q.7-(A)	Evaluate $\int_0^1 \frac{3x}{\sqrt{4-3x}}\ dx$
(B)	Maximize $f(x, y) = x + 3y$ subject to constraints $2x + 5y \leq 30$ $5x + 4y \leq 20$; $x, y \geq 0$
Q.8-(A)	Show that the circles $x^2 + y^2 + 2x - 2y - 7 = 0$ and $x^2 + y^2 - 6x + 4y + 9 = 0$ touches externally
(B)	Use vector method to prove that $\cos(\alpha - \beta) = \cos\alpha\cos\beta + \sin\alpha\sin\beta$
Q.9-(A)	Find an equation of the ellipse with given data centre (0 , 0) , focus (0 , - 3) , vertex (0 , 4)
(B)	If two vertices of an equilateral triangle are A(- 3 , 0) and B(3 , 0). Find the third vertex. How many of these triangles are possible ?

Faisalabad Board-2024

Roll No. : __________

Objective
Paper Code
8197

Intermediate Part Second

MATHEMATICS (Objective) Group – I

Time: 30 Minutes Marks: 20

Q.No.1 **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 marks in that question. Attempt as many questions as given in objective type question paper and leave other circles blank.**

S.#	Questions	A	B	C	D
1	Two non-parallel lines intersect each other at:	1 point	0 point	∞ point	2 points
2	Equation of a straight line passing through $P(c,d)$ and parallel to x-axis is:	$x=0$	$y=0$	$x=d$	$y=d$
3	Normal form of equation of straight line is:	$y=mx+c$	$x\sin(90^\circ-\alpha)+y\cos(90^\circ-\alpha)=p$	$\frac{x}{a}+\frac{y}{b}=1$	$x=\frac{y}{2}-\frac{5}{2}$
4	$ax+b>0$ is:	An identity	A linear equation	Equation	Inequality
5	For hyperbola $b^2=?$	c^2-a^2	a^2-c^2	c^2+a^2	$ac-1$
6	Parametric equations of a circle are:	$x=a\cos\theta$, $y=b\sin\theta$	$x=a\sin\theta$, $y=b\cos\theta$	$x=a\cos\theta$, $y=a\sin\theta$	$x=b\cos\theta$, $y=a\sin\theta$
7	The equation $ax^2+by^2+2gx+2fy+c=0$ will represent circle if:	$a<b$	$a=b$	$a>b$	$a\neq b$
8	If terminal point B of vector AB coincides with its initial point A, then such a vector is called:	Null vector	Unit vector	Coincident vector	Free vector
9	If α,β,γ are direction angles of a vector, then	$0<\alpha<\frac{\pi}{2}$	$0\le\alpha\le\frac{\pi}{2}$	$0<\alpha<\pi$	$0\le\alpha\le\pi$
10	If $\bar{u}=a\hat{i}+b\hat{j}+c\hat{k}$, then projection of $\bar{u}$ along $\hat{k}$ is equal to:	a	b	c	$\bar{u}\cdot\hat{k}$
11	The equations of the form $x=a\cos\theta$, $y=a\sin\theta$ are called:	Implicit equations	Explicit equations	Parametric equations	Homogeneous equations
12	Domain of $f(x)=2+\sqrt{x-1}\ \forall x\in\mathcal{R}$ is:	$[-1,+\infty)$	$[0,+\infty)$	$[1,+\infty)$	$[2,+\infty)$
13	If $f(x)=c^3$, where c is any constant, then $f'(x)=?$	$3c^2$	c^2	$\frac{3}{c}$	0
14	If $y=x^4+2x^2+3$, then $\frac{dy}{dx}=?$	$4x\sqrt{y-1}$	$4x\sqrt{y-2}$	$4x\sqrt{y-3}$	$4x\sqrt{y-4}$
15	At a point of maximum value of a function, its derivative is:	Zero	Positive	Negative	Infinite
16	If $y=\sin 3x$, then $y_2=?$	$3\cos 3x$	$-9\sin 3x$	$-27\cos 3x$	$81\sin 3x$
17	$\int_0^{\sqrt{3}}\frac{1}{1+x^2}dx=?$	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$
18	$\int\frac{\sin x+\cos x}{\sqrt{1+\sin 2x}}dx=?$ is :	$x+c$	$\sin x+c$	$\cos x+c$	$\cos^2 x+c$
19	$\int\tan^2 x\,dx=?$	$\tan x+x+c$	$2\tan x\sec^2 x+c$	$\sec x-x+c$	$\tan x-x+c$
20	$\int\ell n x\,dx=?$	$x\ell nx+c$	$x\ell nx-x+c$	$x\ell nx+x+c$	$\ell nx+x+c$

Intermediate Part Second

1209-XII124 Roll No. ________

MATHEMATICS (Subjective) Group – I

Time: 02:30 Hours Marks: 80

SECTION – I

2. **Attempt any EIGHT parts:** 16

(i) Show that parametric equations $x = a\cos\theta$, $y = b\sin\theta$ represent the equation of Ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$

(ii) If $f(x)=\sqrt{x+1}$, $g(x)=\frac{1}{x^2}$, find $(fog)(x)$

(iii) Evaluate the limit: $\lim\limits_{x\to 0}\frac{\sin ax}{\sin bx}$

(iv) Discuss the continuity of $f(x)=\begin{cases}2x+5, & x\le 2\\ 4x+1, & x>2\end{cases}$ at $x=2$

(v) Use definition to find the derivative of $x(x-3)$ w.r.t. 'x'

(vi) Differentiate $x^4+2x^3+x^2$ w.r.t. 'x'

(vii) Differentiate $(1+x^2)^n$ w.r.t. x^2

(viii) Find $\frac{dy}{dx}$ when $x = y\sin y$

(ix) If $y=e^{-2x}\sin 2x$, find $\frac{dy}{dx}$

(x) Find $\frac{dy}{dx}$ when $y=\sinh^{-1}(x^3)$

(xi) Use Maclaurin Series to prove that $e^x = 1+x+\frac{x^2}{2!}+\frac{x^3}{3!}+\frac{x^4}{4!}+\cdots$

(xii) Find the interval where $f(x)=4-x^2$, $x\in(-2,2)$ is increasing or decreasing in the given domain.

3. **Attempt any EIGHT parts:** 16

(i) Use differentials, find $\frac{dy}{dx}$ and $\frac{dx}{dy}$ of $x^2+2y^2=16$

(ii) Evaluate $\int \sin^2 x\,dx$

(iii) Find $\int\frac{dx}{x(\ell n2x)^2}$

(iv) Evaluate $\int \sin^{-1}x\,dx$

(v) Evaluate $\int_1^2 \ell nx\,dx$

(vi) Find area above the x-axis, bounded by curve $y^2=3-x$ from $x=-1$ to $x=2$

(vii) Solve differential equation $1+\cos x\tan y\frac{dy}{dx}=0$

(viii) Find point three-fifth of way along the line segment from A(– 5 , 8) to B(5 , 3)

(ix) Two points P and O′ are given in xy-coordinate system. Find XY-coordinates of P. $P\left(\frac{3}{2},\frac{5}{2}\right); O'\left(-\frac{1}{2},\frac{7}{2}\right)$

(x) Find an equation of line through $(-4,-6)$ and perpendicular to the line having slope $-\frac{3}{2}$

(xi) Express the system $3x+4y-7=0$, $2x-5y+8=0$, $x+y-3=0$ in matrix form and check whether three lines are concurrent.

(xii) Find lines represented by $x^2-2xy\sec\alpha+y^2=0$

(Continued P/2)

4. **Attempt any NINE parts:** 18

(i) Graph the solution set of linear inequality $5x - 4y \leq 20$ in xy-plane.

(ii) Define corner point of solution region.

(iii) Find center and radius of the circle $5x^2 + 5y^2 + 14x + 12y - 10 = 0$

(iv) Find equation of parabola whose focus is F(–3, 4) and directrix is $3x - 4y + 5 = 0$

(v) Find length of the tangent drawn from the point (– 5 , 4) to the circle $5x^2 + 5y^2 - 10x + 15y - 131 = 0$

(vi) Find focus and vertices of Ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$

(vii) Find equation of tangent to conic $y^2 = 4ax$ at $(at^2, 2at)$

(viii) Find equation of hyperbola with center (0 , 0) , focus (6 , 0) vertex (4 , 0).

(ix) If O is origin and $\overrightarrow{OP} = \overrightarrow{AB}$, find the point P when A and B are (–3 , 7) and (1 , 0) respectively.

(x) Find direction cosines of vector $\underline{v} = \underline{i} - \underline{j} - \underline{k}$

(xi) Find cosine of the angle θ between vectors $\underline{u} = 3\underline{i} + \underline{j} - \underline{k}$, $\underline{v} = 2\underline{i} - \underline{j} + \underline{k}$

(xii) A force $\underline{F} = 7\underline{i} + 4\underline{j} - 3\underline{k}$ is applied at P(1, – 2, 3), find its moment about Q(2, 1, 1)

(xiii) Find the volume of the parallelepiped determined by $\underline{u} = \underline{i} + 2\underline{j} - \underline{k}$, $\underline{v} = \underline{i} - 2\underline{j} + 3\underline{k}$, $\underline{w} = \underline{i} - 7\underline{j} - 4\underline{k}$

SECTION – II   Attempt any THREE questions. Each question carries 10 marks.

5. (a) If $f(x) = \begin{cases} \frac{\sqrt{2x+5} - \sqrt{x+7}}{x-2} & , x \neq 2 \\ k & , x = 2 \end{cases}$, find the value of 'k' so that f is continuous at x = 2. 05

(b) Prove that $y\frac{dy}{dx} + x = 0$ if $x = \frac{1-t^2}{1+t^2}$, $y = \frac{2t}{1+t^2}$ 05

6. (a) Show that $y = x^x$ has minimum value at $x = \frac{1}{e}$ 05

(b) Evaluate: $\int \frac{dx}{(1+x^2)^{3/2}}$ 05

7. (a) Find the area between x-axis and curve $y = \sqrt{2ax - x^2}$, when $a > 0$ 05

(b) Minimize z = 3x + y; subject to constraints $3x + 5y \geq 15$; $x + 3y \geq 9$, $x, y \geq 0$ 05

8. (a) Find the length of the chord cut off from the line 2x + 3y = 13 by the circle $x^2 + y^2 = 26$ 05

(b) Use vector method to show that $\sin(\alpha - \beta) = \sin\alpha\cos\beta - \cos\alpha\sin\beta$ 05

9. (a) Write an equation of the parabola with given elements:
Focus (–3 , 1) ; directrix x – 2y – 3 = 0 05

(b) Find the distance between the given parallel lines. Sketch the lines. Also find an equation of the parallel line lying midway between them:
3x – 4y + 3 = 0 ; 3x – 4y + 7 = 0 05

Faisalabad Board-2024

Roll No. : __________

Objective Paper Code **8196**

Intermediate Part Second

MATHEMATICS (Objective) Group – II

Time: 30 Minutes Marks: 20

☆ ☆ ☆

Q.No.1 **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 marks in that question. Attempt as many questions as given in objective type question paper and leave other circles blank.**

S.#	Questions	A	B	C	D
1	The suitable substitution for $\sqrt{x^2-a^2}$ to be integrated:	$x=a\sin\theta$	$x=a\sec\theta$	$x=a\tan\theta$	$x=a\cos\theta$
2	$\int (ax+b)^n\,dx =$:	$\frac{(ax+b)^{n+1}}{a(n+1)}+c$	$\frac{(ax+b)^{n+1}}{b(n+1)}+c$	$\frac{(ax+b)^{n+1}}{a(n-1)}+c$	$\frac{a(ax+b)^{n+1}}{n+1}+c$
3	$\int\sqrt{1-\cos 2x}\,dx =$:	$-\sqrt{2}\cos x+c$	$\sqrt{2}\sin x+c$	$\sqrt{2}\cos x+c$	$-\sqrt{2}\sin x+c$
4	$\int e^x\left(\frac{1}{x}+\ell nx\right)dx =$:	$\frac{1}{x}e^x+c$	$e^x(\ell nx)+c$	$\frac{e^x}{\ell nx}+c$	$\frac{\ell nx}{e^x}+c$
5	$\frac{d}{dx}(y^n) =$:	ny^{n-1}	ny^{n+1}	$ny^{n-1}\frac{dy}{dx}$	$ny^{n-1}\frac{dx}{dy}$
6	$\frac{d}{dx}(3^x) =$:	$3^x\ell n3$	3^x	$x3^{x-1}$	3^{x+1}
7	If $f(x)=\frac{1}{x-1}$, then $f'(2) =$:	-1	1	0	2
8	$f(x)=-3x^2$ has maximum value at:	$x=-2$	$x=-1$	$x=0$	$x=1$
9	The function $f(x)=(x+2)^2$ is:	Even	Odd	Both A and B	Neither even nor odd
10	$\lim\limits_{x\to 0}(1+3x)^{\frac{2}{x}} =$:	e^2	e^8	e^6	e^4
11	$(\underline{i}\times\underline{k})\times\underline{j} =$:	1	$-\underline{j}$	0	$\underline{i}$
12	$\lvert\cos\alpha\,\underline{i}+\sin\alpha\,\underline{j}+0\underline{k}\rvert =$:	0	1	2	-1
13	If $\underline{a}+\underline{b}+\underline{c}=0$ then:	$\underline{a}\times\underline{b}\times\underline{c}=0$	$\underline{a}\times\underline{b}=\underline{b}\times\underline{c}=\underline{c}\times\underline{a}$	$\underline{a}\cdot\underline{b}=\underline{b}\cdot\underline{c}=\underline{c}\cdot\underline{a}$	$\underline{a}=\underline{b}=\underline{c}$
14	Focus of the parabola $x^2=-16y$ is:	$(0, 4)$	$(0, -4)$	$(4, 0)$	$(-4, 0)$
15	A circle is called a point circle if:	$r=1$	$r=0$	$r=2$	$r=3$
16	Eccentricity of ellipse is:	$e=0$	$e>1$	$0<e<1$	$e=1$
17	The point $(-1, 2)$ satisfies the inequality:	$x-y>4$	$x-y\geq 4$	$x+y<4$	$x+y>5$
18	Equation of horizontal line through $(7,-9)$ is:	$y=-9$	$y=7$	$x=-9$	$x=7$
19	If m_1 and m_2 are the slopes of two lines then lines are perpendicular if:	$m_1m_2=0$	$m_1m_2+1=0$	$m_1m_2+2=0$	$m_1=m_2$
20	Distance of point $(1,-2)$ from y-axis is:	2	1	3	4

1210-XII124-20000

Intermediate Part Second

Roll No. __________

.210-XII124

MATHEMATICS (Subjective) Group – II

Time: 02:30 Hours Marks: 80

SECTION – I

2. Attempt any EIGHT parts: 16

(i) If $f(x)=\begin{cases} x+2, & x\le -1 \\ c+2, & x>-1 \end{cases}$, then find c so that $\lim_{x\to -1} f(x)$ exists.

(ii) Evaluate $\lim_{x\to\infty}\left(\frac{x}{1+x}\right)^x$

(iii) If $g(x)=\frac{3}{x-1}$, $x\neq 1$; then find gog(x)

(iv) Determine whether $f(x)=\frac{3x}{x^2+1}$ is even or odd.

(v) Differentiate $\frac{2x-3}{2x+1}$ w.r.t x

(vi) Find $\frac{dy}{dx}$ if $x=\theta+\frac{1}{\theta}$ and $y=\theta+1$

(vii) Differentiate $\cos\sqrt{x}+\sqrt{\sin x}$ w.r.t x

(viii) Differentiate $\sqrt{\tan x}$ w.r.t x

(ix) Find $f'(x)$ if $f(x)=\ell n(e^x+e^{-x})$

(x) Find y_2 if $x^3-y^3=a^3$

(xi) Prove that $\cos x=1-\frac{x^2}{\underline{|2}}+\frac{x^4}{\underline{|4}}-\frac{x^6}{\underline{|6}}+\ldots\ldots$

(xii) Determine the interval in which $f(x)=\sin x$ is decreasing; $x\in(-\pi,\pi)$

3. Attempt any EIGHT parts: 16

(i) Find dy and δy for the function $y=\sqrt{x}$ when x changes from 4 to 4.41

(ii) Evaluate $\int(3x^2-2x+1)\,dx$

(iii) Evaluate the integral $\int\frac{1-x^2}{1+x^2}\,dx$

(iv) Evaluate $\int x^3\ell nx\,dx$

(v) Evaluate $\int\frac{2x}{x^2-a^2}\,dx$

(vi) Solve the definite integral $\int_{-1}^{3}(x^3+3x^2)\,dx$

(vii) Find the area between x-axis and the curve $y=\cos\frac{1}{2}x$ from $x=-\pi$ to $x=\pi$

(viii) Find 'h' such that points A(–1 , h) , B(3 , 2) and C(7 , 3) are collinear.

(ix) Find the slope and inclination of the line joining the points (4 , 6) and (4, 8).

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

(xi) Check whether the lines $4x-3y-8=0$; $3x-4y-6=0$ and $x-y-2=0$ are concurrent or not.

(xii) Find the angle between the pair of lines $x^2+2xy\sec\alpha+y^2=0$

(Continued P/2)

4. **Attempt any NINE parts:** 18

(i) Indicate solution set of linear inequalities $3x+7y\geq 21$, $x-y\leq 2$

(ii) Define optimal solution.

(iii) Find center and radius of the circle $x^2+y^2-6x+4y+13=0$

(iv) Find length of tangent drawn from point (–5 , 4) to the circle $5x^2+5y^2-10x+15y-131=0$

(v) Find the vertex and directrix of parabola $x^2=5y$

(vi) Find equation of ellipse with data vertices (–1 , 1) , (5 ,1) Foci : (4 , 1) , (0 , 1)

(vii) Find equation of hyperbola with data Foci $(0,\pm 9)$, directrices $y=\pm 4$

(viii) Find equation of normal to $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ at $(a\sec\theta, b\tan\theta)$

(ix) Find unit vector in the direction of vector $\underline{v}=-\frac{\sqrt{3}}{2}\underline{i}-\frac{1}{2}\underline{j}$

(x) Find direction cosines of vector $\underline{v}=6\underline{i}-2\underline{j}+\underline{k}$

(xi) Show that the set of points P(1, 3, 2) , Q(4, 1, 4) and R(6, 5, 5) forms a right triangle.

(xii) Compute cross product $\underline{b}\times\underline{a}$ if $\underline{a}=3\underline{i}-2\underline{j}+\underline{k}$, $\underline{b}=\underline{i}+\underline{j}$

(xiii) Prove that vectors $\underline{i}-2\underline{j}+3\underline{k}$, $-2\underline{i}+3\underline{j}-4\underline{k}$, $\underline{i}-3\underline{j}+5\underline{k}$ are coplaner.

SECTION – II Attempt any THREE questions. Each question carries 10 marks.

5. (a) If $f(x)=\begin{cases}\frac{\sqrt{2x+5}-\sqrt{x+7}}{x-2}, & x\neq 2,\\ k, & x=2\end{cases}$ find the value of 'k' for which f is continuous at x = 2. 05

(b) Find $\frac{dy}{dx}$, if $y=x\sin^{-1}\left(\frac{x}{a}\right)+\sqrt{a^2-x^2}$ 05

6. (a) Show that $y=x^x$ has minimum value at $x=\frac{1}{e}$ 05

(b) Evaluate the indefinite integral $\int\sqrt{4-5x^2}\,dx$ 05

7. (a) Evaluate $\int_{\pi/6}^{\pi/2}\frac{\cos x}{\sin x(2+\sin x)}dx$ 05

(b) Graph the feasible region of linear inequalities and find corner points:
$2x+3y\leq 18$; $2x+y\leq 10$; $x+4y\leq 12$ 05

8. (a) Find an equation of circle passes through A(5 , 1) and tangent to line 2x – y – 10 = 0 at B(3 , –4) 05
(b) Prove that the angle in a semi-circle is a right angle. 05

9. (a) Find the focus, vertex and directrix of the parabola; $y^2=-8(x-3)$ 05
(b) Find the lines represented by $9x^2+24xy+16y^2=0$ and also find measure of the angle between them. 05

1210-XII124-20000

Roll No. of Candidate ______________ Gujranwala Board-2024

MATHEMATICS
Time: 30 Minutes

Intermediate Part-II , Class 12th (1stA 424-IV)
OBJECTIVE
Code: 8197

GROUP: I
PAPER: II
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 that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling of two or more circles will result in zero mark in that question.

1- 1- $\int \text{Sec}x \, \text{Tan}x \, dx = ?$
(A) $\text{Sec}x + c$ (B) $\text{Sec}^2x + c$ (C) $\text{Tan}x + c$ (D) $\ln|\text{Sec}x + \tan x| + c$

2- The focus of parabola $x^2 = -16y$ is
(A) $(0, -4)$ (B) $(0, 0)$ (C) $(4, 0)$ (D) $(-4, 0)$

3- $\int_0^2 |x| dx$ is
(A) 0 (B) 1 (C) 2 (D) 4

4- Derivative of $y = f(x)$ at $x = a$ represents slope of
(A) tangent line at $x = a$ (B) secant line (C) perpendicular line (D) straight line

5- Projection of vector $\underline{v}$ along vector $\underline{u}$ is
(A) $\frac{\underline{u}\cdot\underline{v}}{|\underline{u}|}$ (B) $\frac{\underline{u}\cdot\underline{v}}{|\underline{v}|}$ (C) $\frac{\underline{u}\cdot\underline{u}}{|\underline{u}|}$ (D) $\frac{\underline{v}\cdot\underline{v}}{|\underline{v}|}$

6- Which one is true?
(A) $\underline{i}\times\underline{i} = \underline{i}$ (B) $\underline{i}\cdot\underline{i} = \underline{i}$ (C) $\underline{k}\times\underline{k} \neq 0$ (D) $\underline{k}\times\underline{i} = -\underline{j}$

7- Which one equation represents a circle?
(A) $y^2 = 8x$ (B) $3x^2 + 3y^2 = 9$ (C) $3x^2 + 5y^2 = 9$ (D) $x^2 - 2y = 0$

8- Which one is point-slope form of a straight line?
(A) $y = mx + c$ (B) $y - y_1 = m(x - x_1)$ (C) $\frac{x}{a} + \frac{y}{b} = 1$ (D) $\frac{x}{a} - \frac{y}{b} = 1$

9- Order of differential equation $\frac{d^2y}{dx^2} + \frac{dy}{dx} - 2x = 0$ is
(A) 1 (B) 0 (C) 2 (D) 3

10- The interval in which $f(x) = 4 - x^2$; $x \in (-2, 2)$ is increasing
(A) $(0, 2)$ (B) $(-2, 0)$ (C) $(-2, 2)$ (D) $(0, 1)$

11- The function $f(x) = \frac{x^2 - 1}{x - 1}$ is not defined at
(A) $x = 0$ (B) $x = 1$ (C) $x = 2$ (D) $x = -1$

12- If $f(x) = x^{2/3}$, the $f'(8)$ is
(A) 3 (B) $\frac{1}{3}$ (C) $\frac{2}{3}$ (D) $\frac{1}{2}$

13- $\int \frac{f'(x)}{f(x)} dx = ?$
(A) $\ln|x| + c$ (B) $\ln|f(x)| + c$ (C) $\ln|f'(x)| + c$ (D) $\ln f(x)\cdot f'(x) + c$

14- Slope of the line passing through the points $(0, -1)$ and $(7, -15)$ is
(A) 2 (B) 0 (C) 1 (D) -2

15- $\lim_{x\to-\infty}(e^x) = ?$
(A) ∞ (B) $-\infty$ (C) 1 (D) 0

16- $[\underline{u}\ \underline{v}\ \underline{v}] = ?$
(A) 1 (B) -1 (C) 0 (D) $\underline{v}$

17- Which point is not solution of inequality $x - 2y \leq 6$
(A) $(1, 1)$ (B) $(0, -1)$ (C) $(14, 0)$ (D) $(-4, 0)$

18- Major axis of ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ with $(a > b)$ is
(A) $x = 0$ (B) $y = 0$ (C) $x = 1$ (D) $y = 1$

19- Derivative of $\text{Tan}^{-1}x$ w.r.t. x is
(A) $\frac{1}{1 - x^2}$ (B) $\frac{1}{x^2 - 1}$ (C) $\frac{1}{1 + x^2}$ (D) $1 + x^2$

20- Distance of line $5x + 12y + 39 = 0$ from origin is
(A) 3 (B) 5 (C) 12 (D) 39

313-(IV)-1stA 424-25000

MATHEMATICS — Intermediate Part-II, Class 12th (1stA 424) — GROUP: I, PAPER: II
Time: 2:30 hours — Marks: 80

SUBJECTIVE

Note: Section I is compulsory. Attempt any three (3) questions from Section II.

SECTION I

2. Write short answers to any EIGHT questions: (2 x 8 = 16)

i- Let $f(x) = x^2 - x$, find the value of $f(x-1)$.

ii- State the domain and range of f^{-1} if $f(x) = \dfrac{1}{x+3}$

iii- Evaluate $\lim\limits_{x\to\pi} \dfrac{\sin x}{\pi - x}$

iv- Express $\lim\limits_{n\to\infty}\left(1+\dfrac{3}{n}\right)^{2n}$ in term of e.

v- Differentiate $\dfrac{x^2+1}{x^2-3}$ w.r.t. 'x'

vi- Find $\dfrac{dy}{dx}$ if $x = at^2$ and $y = 2at$

vii- Prove that $\dfrac{d}{dx}(\cot^{-1} x) = \dfrac{-1}{1+x^2}$

viii- Differentiate $\left(\cos\sqrt{x} + \sqrt{\sin x}\right)$ w.r.t 'x'

ix- Find $\dfrac{dy}{dx}$ if $y = \sinh^{-1}(ax+b)$

x- Find $\dfrac{dy}{dx}$ if $y = \log_{10}(ax^2+bx+c)$

xi- Find $f'(x)$ if $f(x) = \dfrac{e^x}{e^{-x}+1}$

xii- Define a stationary point.

3. Write short answers to any EIGHT questions: (2 x 8 = 16)

i- Use differential to find $\dfrac{dy}{dx}$, if $xy - \ln x = c$

ii- Evaluate $\displaystyle\int \frac{(1-\sqrt{x})^2}{\sqrt{x}}\,dx$, $(x>0)$

iii- Find $\int \sec x\,dx$

iv- Integrate $\int \sin^{-1}x\,dx$

v- Evaluate $\int e^x(\cos x - \sin x)\,dx$

vi- Calculate $\displaystyle\int_1^2 \frac{x}{x^2+2}\,dx$

vii- Solve the differential equation $\dfrac{dy}{dx} = \dfrac{1-x}{y}$

viii- Find an equation of vertical line through (–5 , 3).

ix- Write the equation of line in two intercepts form.

x- Convert $15y - 8x + 3 = 0$ in slope intercept form.

xi- Find the equation of line passing through A(–6 , 5) having slope 7.

xii- Show that the points A(–1 , 2), B(7 , 5) and C(2 , –6) are vertices of right triangle.

(Turn over)

4. Write short answers to any NINE questions: (2 x 9 = 18)

i- What is feasible region?

ii- Derive equation of circle in standard form.

iii- Write an equation of circle with centre (–3 , 5) and radius 7.

iv- Check the position of point (5 , 6) with respect to circle: $2x^2 + 2y^2 + 12x - 8y + 1 = 0$

v- Find equation of hyperbola with foci $(0, \pm 9)$, directrices $y = \pm 4$.

vi- Find the focus and directrix of the parabola if $x^2 = 5y$.

vii- Find an equation of ellipse with foci $(\pm 3, 0)$ and minor axis length 10.

viii- Indicate the solution set of system of linear inequality by shading $4x - 3y \leq 12$; $x \geq -\frac{3}{2}$

ix- Define equal vector, give an example.

x- Find the magnitude and direction cosines of $\underline{v} = 4\underline{i} - 5\underline{j}$

xi- Find scalar "α" so that the vectors $2\underline{i} + \alpha\underline{j} + 5\underline{k}$ and $3\underline{i} + \underline{j} + \alpha\underline{k}$ are perpendicular.

xii- Which vectors, if any, are parallel or perpendicular
$\underline{u} = \underline{i} + 2\underline{j} - \underline{k}$, $\underline{v} = -\underline{i} + \underline{j} + \underline{k}$, $\underline{w} = \frac{-\pi}{2}\underline{i} - \pi\underline{j} + \frac{\pi}{2}\underline{k}$

xiii- Prove that the vectors $\underline{i} - 2\underline{j} + 3\underline{k}$, $-2\underline{i} + 3\underline{j} - 4\underline{k}$ and $\underline{i} - 3\underline{j} + 5\underline{k}$ are coplanar.

SECTION II

5- (a) Evaluate $\lim_{\theta \to 0} \frac{\tan\theta - \sin\theta}{\sin^3\theta}$ 5

(b) If $\tan y(1 + \tan x) = 1 - \tan x$, show that $\frac{dy}{dx} = -1$ 5

6- (a) If $x = \sin\theta, y = \sin m\theta$, show that $(1 - x^2)y_2 - xy_1 + m^2 y = 0$ 5

(b) Evaluate $\int \frac{\sqrt{2}}{\sin x + \cos x} dx$ 5

7- (a) Evaluate $\int_0^{\frac{\pi}{4}} \frac{1}{1 + \sin x} dx$ 5

(b) Maximize $f(x, y) = 2x + 5y$, subject to the constraints $2y - x \leq 8$; $x - y \leq 4$; $x \geq 0$; $y \geq 0$. 5

8- (a) Find the length of the chord cut off from the line $2x + 3y = 13$ by the circle $x^2 + y^2 = 26$. 5

(b) Prove that in any ΔABC, $b^2 = c^2 + a^2 - 2ca \cos B$ 5

9- (a) Find the interior angles of a triangle with vertices $A(-2, 11)$, $B(-6, -3)$ and $C(4, -9)$ 5

(b) Find the centre, foci, eccentricity, vertices and directrices of the Ellipse $x^2 + 4y^2 = 16$ 5

313-1st A 424-25000

Gujranwala Board-2024

Roll No. of Candidate ________________

MATHEMATICS **Time: 30 Minutes**	**Intermediate Part-II , Class 12th (1st A 424- IV)** **OBJECTIVE** **Code: 8198**	**GROUP: II** **PAPER: II** **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 that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling of two or more circles will result in zero mark in that question.

1- 1- Differential of $\sqrt{x}$ is

(A) $\frac{1}{\sqrt{x}}dx$ (B) $\frac{2}{\sqrt{x}}dx$ (C) $\frac{1}{2\sqrt{x}}dx$ ● (D) $\frac{-1}{\sqrt{x}}dx$

2- If $a = b$ then equation $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ represent

(A) Ellipse (B) Circle ● (C) Parabola (D) Hyperbola

3- Degree of differential equation $\frac{d^2y}{dx^2}+\frac{dy}{dx}-3x=0$ is

(A) 0 (B) 2 (C) 1 ● (D) 3

4- $\frac{d}{dx}(\text{Sin}\ln x)=?$

(A) $\frac{e^x-e^{-x}}{2}$ ● (B) $\frac{e^x+e^{-x}}{2}$ (C) e^x-e^{-x} (D) e^x+e^{-x}

5- Magnitude of a vector $\underline{v}=-\underline{i}+\underline{j}$ is

(A) a (B) $\sqrt{2}$ ● (C) $-\sqrt{2}$ (D) $\sqrt{3}$

6- If dot product of two non-zero vectors is zero then vectors will be

(A) perpendicular ● (B) parallel (C) collinear (D) all of these

7- Length of latus ractum of parabola $y^2 = 4ax$ is

(A) 2a (B) 4ax (C) 4a ● (D) $\frac{1}{2a}$

8- Every homogeneous equation $ax^2+2hxy+by^2=0$ represent two real lines through origin if

(A) $h^2-ab<0$ (B) $h^2-ab>0$ (C) $h^2=ab$ ● (D) both (B) and (C)

9- If α is constant then $\int \cot\alpha\, dy$ is

(A) $\text{Sin}\alpha + c$ (B) $-\text{Sin}\alpha + c$ (C) $x\text{Sin}\alpha + c$ (D) $y\cot\alpha + c$ ●

10- If $f(x)=\text{Cos}x$, then $f'\left(\frac{\pi}{2}\right)$ is

(A) -1 ● (B) 1 (C) 0 (D) $\frac{1}{2}$

11- $\lim_{x\to a}\frac{x^3-a^3}{x-a}=?$

(A) $3a^2$ ● (B) a^2 (C) 0 (D) un-defined

12- Derivative of $\sqrt{x}$ at $x=a$ is

(A) $\frac{1}{\sqrt{a}}$ (B) $-\frac{1}{2\sqrt{a}}$ (C) $\frac{1}{2\sqrt{a}}$ ● (D) $2\sqrt{a}$

(Turn over)

13- $\int \frac{\ell nx}{x} dx$ is equal to

(A) $\ell n(\ell nx) + c$ (B) $\frac{(\ell nx)^2}{2} + c$ ● (C) $\ell nx + c$ (D) $\frac{\ell nx}{2} + c$

14- Slope intercept form of a line is

(A) $y = mx + c$ ● (B) $\frac{x}{a} + \frac{y}{b} = 1$ (C) $x = 0$ (D) $y = 0$

15- The function $f(x) = \frac{2+3x}{2x}$ is not continuous at

(A) $x = 3$ (B) $x = 0$ ● (C) $x = -\frac{2}{3}$ (D) $x = 1$

16- $\frac{1}{6}[\underline{u}\ \underline{v}\ \underline{w}]$ is formula to calculate

(A) area of triangle (B) volume of parallelpipped

(C) volume of tetrahedron ● (D) area of parallelogram

17- (2 , 1) is solution of in-equality

(A) $2x + y > 5$ (B) $x - 2y > 1$ (C) $3x - 5y < 7$ ● (D) $2x + y < 5$

18- Eccentricity of hyperbola is

(A) $e < 1$ (B) $e = 0$ (C) $e = 1$ (D) $e > 1$ ●

19- $\frac{d}{dx}\left[\frac{1}{g(x)}\right]$ is equal to

(A) $\frac{1}{[g(x)]^2}$ (B) $\frac{-g'(x)}{g(x)}$ (C) $\frac{-1}{[g(x)]^2}$ (D) $\frac{-g'(x)}{[g(x)]^2}$ ●

20- Distance of point (Cos3x , Sin3x) from origin is

(A) 9 (B) 6 (C) 3 (D) 1 ●

314-(IV)-1st A 424-24000

MATHEMATICS — Intermediate Part-II , Class 12th (1stA 424) — **GROUP: II**

Time: 2:30 hours — **PAPER: II**

SUBJECTIVE — **Marks: 80**

Note: Section I is compulsory. Attempt any three (3) questions from Section II.

SECTION I

2. Write short answers to any EIGHT questions: (2 x 8 = 16)

i- Define rational function. Give one example also.

ii- Find gof(x) , when $f(x)=\sqrt{x+1}$; $g(x)=\frac{1}{x^2}$, $x\neq 0$

iii- Evaluate $\lim\limits_{\theta\to 0}\frac{1-\cos\theta}{\theta}$

iv- Find 'c' so that $\lim\limits_{x\to -1} f(x)$ exists, when $f(x)=\begin{cases} x+2 , & x\leq -1 \\ c+2 , & x>-1 \end{cases}$

v- Differentiate $(x^2+5)(x^3+7)$ w.r.t x.

vi- Find derivative of $\tan^3\theta\sec^2\theta$ w.r.t θ.

vii- Find $\frac{dy}{dx}$, if $y=\sinh^{-1}\left(\frac{x}{2}\right)$

viii- Define critical value and critical point of function f.

ix- Differentiate $\cot^{-1}\left(\frac{x}{a}\right)$ w.r.t x.

x- Find derivative of $\frac{x^2+1}{x^2-3}$ w.r.t x.

xi- State product rule for derivative of two functions.

xii- Differentiate $\sin^2 x$ w.r.t $\cos^4 x$.

3. Write short answers to any EIGHT questions: (2 x 8 = 16)

i- Find δy if $y=x^2-1$ and x changes from 3 to 3.02

ii- Evaluate $\int\frac{(1-\sqrt{x})^2}{\sqrt{x}}dx$

iii- Evaluate $\int\frac{dx}{x(\ln 2x)^3}$, $(x>0)$

iv- Evaluate $\int x\tan^2 x\,dx$

v- Evaluate $\int\frac{e^x(1+x)}{(2+x)^2}dx$

vi- Evaluate $\int_0^{\pi/6} x\cos x\,dx$

vii- Solve the differential equation $\sin y\,\mathrm{cosec}\,x\frac{dy}{dx}=1$

viii- Find the distance and midpoint of line joining A(–8 , 3) and B(2 , –1).

ix- Find an equation of line with x-intercept:–9 and slope:–4

x- Transform the equation $5x-12y+39=0$ into slope intercept form.

xi- Determine the value of P such that the lines $2x-3y-1=0$, $3x-y-5=0$ and $3x+Py+8=0$ meet at a point.

xii- Find the angle between the lines represented by $x^2-xy-6y^2=0$

(Turn over)

4. Write short answers to any NINE questions: (2 x 9 = 18)

i- Define feasible region.

ii- Graph the feasible region of inequality $3x+2y\geq 6$, $x\geq 0$, $y\geq 0$

iii- Write an equation of circle with centre (5 , –2) and radius 4.

iv- Write down equation of tangent to $x^2+y^2=25$ at (4 , 3)

v- Find the focus and vertex of parabola $y^2=8x$

vi- Write equation of the ellipse whose foci $(\pm 3, 0)$ and minor axis of length 10.

vii- Find the foci and eccentricity of $\frac{x^2}{4}-\frac{y^2}{9}=1$

viii- Find the length of tangent drawn from point $(-5, 4)$ to the circle $x^2+y^2-2x+3y-26=0$

ix- Find a unit vector in the same direction of the vector $\underline{v}=[3, -4]$

x- Write the direction cosine of vector $\underline{v}=-\hat{i}+\hat{j}+\hat{k}$

xi- Find a scalar 'α' so that vectors $2\hat{i}+\alpha\hat{j}+5\hat{k}$ and $3\hat{i}+\hat{j}+\alpha\hat{k}$ are perpendicular.

xii- If $\underline{a}=4\hat{i}+3\hat{j}+\hat{k}$ and $\underline{b}=2\hat{i}-\hat{j}+2\hat{k}$, find $|\underline{a}\times\underline{b}|$

xiii- A force $\underline{F}=4\hat{i}-3k$ passes through $A(2, -2, 5)$. Find its moment about $B(1, -3, 1)$.

SECTION II

5- (a) Evaluate : $\lim_{\theta\to 0}\frac{1-\cos p\theta}{1-\cos q\theta}$ 5

(b) Differentiate : $Sec^{-1}\left(\frac{x^2+1}{x^2-1}\right)$ w.r.t "x" 5

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

(b) Evaluate : $\int Cosec^3 x\, dx$ 5

7- (a) Evaluate : $\int_0^{\pi/4}\frac{\sin x-1}{\cos^2 x}dx$ 5

(b) Graph the feasible region of the following system of linear inequalities and find the corner points $2x-3y\leq 6$ 5

$2x+3y\leq 12$

$x\geq 0$, $y\geq 0$

8- (a) Find an equation of the circle passing through the points A(1 , 2) and B(1 , –2) and touching the line $x+2y+5=0$ 5

(b) Use vectors, to prove that the diagonals of a parallelogram bisect each other. 5

9- (a) Find the equation of perpendicular bisector of a segment joining the points A(3 , 5) and B(9 , 8). 5

(b) Find the equation of parabola with focus (–3 , 1) and directrix x = 3. 5

314-1st A 424-24000

Roll No Lahore Board-2024 (To be filled in by the candidate)

(Academic Sessions 2020 – 2022 to 2022 – 2024)

MATHEMATICS 224-1st Annual-(INTER PART – II) Time Allowed : 30 Minutes

Q.PAPER – II (Objective Type) GROUP – I Maximum Marks : 20

PAPER CODE = 8195

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 answer-book. Cutting or filling two or more circles will result in zero mark in that question.

1-1 If $f(x)=3-\sqrt{x}$ then $f'(1)$ is equal to :

(A) $-\frac{1}{2}$ (B) 0 (C) $\frac{1}{2}$ (D) 1

2 $4\int_0^{\frac{\pi}{4}} \sin 2x\,dx =$:

(A) $4-2\sqrt{2}$ (B) $\frac{\sqrt{3}}{2}$ (C) $\frac{1}{2}$ (D) $\sqrt{3}$

3 $\lim_{x\to 0} \frac{\sin ax}{\sin bx} =$:

(A) $-\frac{a}{b}$ (B) $-\frac{b}{a}$ (C) $\frac{a}{b}$ (D) $\frac{b}{a}$

4 $\int \ell nx\,dx =$:

(A) $\frac{1}{x}+c$ (B) $x\,\ell nx+c$ (C) $\frac{(\ell nx)^2}{2}+c$ (D) $x(\ell nx-1)+c$

5 Let $f(x)=\sqrt{1-x^2}$ in R then domain of f is :

(A) Real numbers (B) $|x|\le 1$

(C) Negative real numbers (D) Integers

6 If $\int x\,e^{x^2}dx = k\,e^{x^2}$ then k = :

(A) $\frac{1}{2}$ (B) $\frac{1}{3}$ (C) $\frac{x}{3}$ (D) $\frac{x}{2}$

7 If $f(x)$ has second derivative at c such that $f'(c)=0$ and $f''(c)<0$ then c is point of :

(A) Maxima (B) Minima (C) Point of inflection (D) Origin

8 If $y=\cot x$, then $\frac{dy}{dx}$ is given by :

(A) $\operatorname{cosec}^2 x$ (B) $-\operatorname{cosec}^2 x$ (C) $\tan x$ (D) $-\operatorname{cosec} x \cot x$

9 $\int \frac{1}{x^2+a^2}dx =$:

(A) $\tan^{-1}\frac{x}{a}+c$ (B) $\frac{1}{a}\tan^{-1}\frac{x}{a}+c$ (C) $\frac{a}{x}\tan^{-1}\frac{x}{a}+c$ (D) $\frac{1}{a}\tan^{-1}\frac{a}{x}+c$

(Turn Over)

Lahore Board-2024

1-10	For $y = \log_e 5x$, $\frac{dy}{dx} =$: (A) $\frac{1}{x}$ (B) 5 (C) $\frac{1}{5x}$ (D) 1
11	The straight line $y = mx + c$ is tangent to the parabola $y^2 = 4ax$ if : (A) $c = \frac{a}{m}$ (B) $c = \frac{m}{a}$ (C) $c = \frac{a^2}{m^2}$ (D) $c = am$
12	y-coordinate of any point on x-axis is : (A) 0 (B) x (C) 1 (D) y
13	The volume of parallelepiped determined by $\underline{u} = \underline{i} + 2\underline{j} - \underline{k}$, $\underline{v} = \underline{i} - 2\underline{j} + 3\underline{k}$, $\underline{w} = \underline{i} - 7\underline{j} - 4\underline{k}$ is : (A) 48 (B) 50 (C) 52 (D) 55
14	The distance between the centres of the circles $x^2 + y^2 + 2x + 2y + 1 = 0$ and $x^2 + y^2 - 4x - 6y - 3 = 0$ is : (A) 1 (B) 4 (C) 5 (D) 15
15	If $\underline{a} + \underline{b} + \underline{c} = 0$ then which one is correct : (A) $\underline{a} \times \underline{b} \times \underline{c} = 0$ (B) $\underline{a} \times \underline{b} = \underline{b} \times \underline{c} = \underline{c} \times \underline{a}$ (C) $\underline{a} \cdot \underline{b} = \underline{b} \cdot \underline{c} = \underline{c} \cdot \underline{a}$ (D) $\underline{a} = \underline{b} = \underline{c}$
16	The x-intercept of the line $2x + 3y - 1 = 0$ is : (A) 2 (B) 3 (C) $\frac{1}{3}$ (D) $\frac{1}{2}$
17	The graph of $2x - 3y \le 6$ is : (A) On the origin side (B) Not on the origin side (C) Not decided (D) Through the origin
18	The area of the triangle having $\underline{a}$ and $\underline{b}$ as its two sides is given by : (A) $\lvert \underline{a} \cdot \underline{b} \rvert$ (B) $\frac{1}{2} \lvert \underline{a} \cdot \underline{b} \rvert$ (C) $\lvert \underline{a} \times \underline{b} \rvert$ (D) $\frac{1}{2} \lvert \underline{a} \times \underline{b} \rvert$
19	Homogeneous equation of second degree $ax^2 + 2hxy + by^2 = 0$ where a, b, h are not all zero, represents two imaginary lines if : (A) $h^2 = ab$ (B) $h^2 > ab$ (C) $h^2 < ab$ (D) $h = ab$
20	The eccentricity of the ellipse $\frac{x^2}{64} + \frac{y^2}{28} = 1$ is : (A) $\frac{3}{4}$ (B) $\frac{4}{3}$ (C) $\sqrt{\frac{3}{4}}$ (D) $\sqrt{\frac{4}{3}}$

173-224-I-(Objective Type)- 8500 (8195)

Roll No ____________________ (To be filled in by the candidate)

(Academic Sessions 2020 – 2022 to 2022 – 2024)

MATHEMATICS 224-1st Annual-(INTER PART – II) Time Allowed : 2.30 hours
PAPER – II (Essay Type) GROUP – I Maximum Marks : 80

SECTION – I

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

(i) Prove that $\cosh^2 x - \sinh^2 x = 1$

(ii) If $f(x)=\sqrt{x+4}$ then find $f(x-1)$

(iii) Evaluate $\lim\limits_{x\to 3} \dfrac{x-3}{\sqrt{x}-\sqrt{3}}$

(iv) Evaluate $\lim\limits_{x\to 0} \dfrac{1-\cos 2x}{x^2}$

(v) Differentiate $y=(x^2+5)(x^3+7)$ with respect to x.

(vi) Differentiate $\dfrac{x^2+1}{x^2-3}$ with respect to x.

(vii) Find derivative of $(x^3+1)^9$ with respect to x.

(viii) Differentiate $\cos\sqrt{x}+\sqrt{\sin x}$ with respect to the variable involved.

(ix) $\dfrac{dy}{dx}=$? If $y=e^{x^2+1}$

(x) Find Maclaurin Series for $\sin x$

(xi) Determine the interval in which $f(x)=4-x^2$, $x\in(-2,2)$ is increasing or decreasing.

(xii) Find $f'(x)$ if $f(x)=\sqrt{\ell n(e^{2x}+e^{-2x})}$

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

(i) Using differential to find $\dfrac{dy}{dx}$ if $xy+x=4$

(ii) Evaluate $\int (a-2x)^{\frac{3}{2}}\, dx$

(iii) Evaluate $\int \sec x\, dx$

(iv) Evaluate $\int x\,\ell nx\, dx$

(v) Evaluate $\int_1^2 \dfrac{x}{x^2+2}\, dx$

(vi) Find the area bounded by cos function from $x=-\dfrac{\pi}{2}$ to $x=\dfrac{\pi}{2}$

(vii) Solve the differential equation $\dfrac{dy}{dx}=\dfrac{y}{x^2}$

(viii) Find h such that A (– 1 , h) , B (3 , 2) and C (7 , 3) are collinear.

(ix) The coordinates of a point P are (3 , 2). The axes are translated through the point $O'(1,3)$. Find the coordinates of P referred to new axes.

(x) Find k so that the line joining A (7 , 3) ; B (k , – 6) and the line joining C (– 4 , 5) ; D (– 6 , 4) are parallel.

(xi) Find the point of intersection of the lines $x-2y+1=0$ and $2x-y+2=0$

(xii) Find measure of the angle between the lines represented by $9x^2+24xy+16y^2=0$

 (Turn Over)

18

4. **Write short answers to any NINE (9) questions :**

(i) Graph the solution set of inequality $3x-2y\geq 6$

(ii) Define feasible region.

(iii) Find the equation of circle whose ends of diameter are (– 3 , 2) and (5 , – 6)

(iv) Find the position of the point (5 , 6) w.r.t the circle $2x^2+2y^2+12x-8y+1=0$

(v) Find the focus and vertex of parabola $y^2=-8(x-3)$

(vi) Find the eccentricity of ellipse $x^2+4y^2=16$

(vii) Find the centre and eccentricity of the conic $\frac{y^2}{4}-x^2=1$

(viii) Identify the conic represented by $4x^2-4xy+y^2-6=0$

(ix) Find the work done by a constant force $\vec{F}=2\hat{i}+4\hat{j}$, if its point of application to a body moves it from A (1 , 1) to B (4 , 6)

(x) Find the value of ' α ' such that $\alpha \underline{i}+\underline{j}$, $\underline{i}+\underline{j}+3\underline{k}$ and $2\underline{i}+\underline{j}-2\underline{k}$ are coplanar.

(xi) If $\vec{u}=2i-j+k$ and $\vec{v}=4i+2j-k$ find $\vec{u}\times\vec{v}$

(xii) Find a vector whose magnitude is 4 and is parallel to $2\underline{i}-3\underline{j}+6\underline{k}$

(xiii) If A (1 , – 1) , B (2 , 0) , C (– 1 , 3) and D (– 2 , 2) are given points, find the sum of the vectors $\overrightarrow{AB}$ and $\overrightarrow{CD}$

SECTION – II

Note : Attempt any THREE questions.

5. (a) Find m and n , so that given function f is continuous at $x=3$

$$f(x)=\begin{cases} mx & if\ x<3 \\ n & if\ x=3 \\ -2x+9 & if\ x>3 \end{cases}$$ 5

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

6. (a) If $y=e^{-ax}$, then show that $\frac{d^3y}{dx^3}+a^3y=0$ 5

(b) Evaluate the indefinite integral $\int\sqrt{x^2-a^2}\,dx$ 5

7. (a) Solve the differential equation $2e^x\tan y\,dx+(1-e^x)\sec^2 y\,dy=0$ 5

(b) Maximize $f(x,y)=x+3y$ subject to the constraints
$2x+5y\leq 30$; $5x+4y\leq 20$, $x\geq 0$, $y\geq 0$ 5

8. (a) Find equations of the tangents to the circle $x^2+y^2=2$ perpendicular to the line $3x+2y=6$ 5

(b) Using vectors, prove that $\sin(\alpha+\beta)=\sin\alpha\cos\beta+\cos\alpha\sin\beta$ 5

9. (a) Find centre, foci, eccentricity, vertices and equation of directrices of $\frac{(y+2)^2}{9}-\frac{(x-2)^2}{16}=1$ 5

(b) Find the equations of altitudes of the triangle whose vertices are A (– 3 , 2) , B (5 , 4) , C (3 , – 8) 5

173-224-I-(Essay Type)-34000

Lahore Board-2024

Roll No ______________________________ (To be filled in by the candidate)

(Academic Sessions 2020 – 2022 to 2022 – 2024)

MATHEMATICS 224-1st Annual-(INTER PART – II) Time Allowed : 30 Minutes

Q.PAPER – II (Objective Type) GROUP – II Maximum Marks : 20

PAPER CODE = 8192

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 answer-book. Cutting or filling two or more circles will result in zero mark in that question.

1-1	If $f(x)=\frac{1}{x^2}$ when which of the following is equal to *fof (x)* :			
	(A) x^4	(B) x^2	(C) 1	(D) $\frac{1}{x^4}$
2	What is the value of $\lim\limits_{x\to 0}(x\sin x)$:			
	(A) α	(B) -1	(C) 1	(D) 0
3	What is the value of $\sqrt{1-x^2}\,\frac{d}{dx}(\sin^{-1}x+\cos^{-1}x)$:			
	(A) $\sqrt{1-x^2}$	(B) 0	(C) 2	(D) $\frac{1}{x}$
4	$\frac{d}{dx}(\sinh^{-1}x)=$:			
	(A) $\frac{1}{\sqrt{1-x^2}}$	(B) $\frac{-1}{\sqrt{1-x^2}}$	(C) $\frac{1}{\sqrt{1+x^2}}$	(D) $\frac{-1}{\sqrt{1+x^2}}$
5	Derivative of x^3 w.r.t x^3 is :			
	(A) 0	(B) 1	(C) x^3	(D) $3x^2$
6	If $f(x)=a^x$ then $f'(x)=$:			
	(A) $a^x \ell na$	(B) $a^x \ell nx$	(C) $a^x(\ell na)^2$	(D) $(a^x)^2 \ell na$
7	$\int x^{-1}\,dx$:			
	(A) 0	(B) $-x^{-2}+c$	(C) $\propto$	(D) $\ell nx+c$
8	$\int_0^1 \frac{1}{\sqrt{1-x^2}}\,dx=$:			
	(A) $\frac{\pi}{6}$	(B) $\frac{\pi}{4}$	(C) $\frac{\pi}{3}$	(D) $\frac{\pi}{2}$
9	$\int \tan x\,dx=$:			
	(A) $\ell n\cot x+c$	(B) $\ell n\sec x+c$	(C) $\ell n\sin x+c$	(D) $\ell n\operatorname{cosec} x+c$

(Turn Over)

Lahore Board-2024

1.10	$\int_0^{\pi} \sin x\, dx =$: (A) 0 (B) 1 (C) 2 (D) π
11	A linear equation in two variables represents : (A) Circle (B) Ellipse (C) Hyperbola (D) Straight line
12	Intercept form of equation of line is : (A) $\frac{x}{a}+\frac{y}{b}=1$ (B) $\frac{x}{a}+\frac{y}{b}=0$ (C) $\frac{x}{a}-\frac{y}{b}=1$ (D) $\frac{x}{a}-\frac{y}{b}=0$
13	Distance of point $(\cos 3x, \sin 3x)$ from origin is : (A) 3 (B) 6 (C) 9 (D) 1
14	(0 , 0) is one of the solution of inequality : (A) $3x+5y>4$ (B) $2x+3y<4$ (C) $x+3y>5$ (D) $2x+3y>5$
15	Equation of circle with centre (3 , 0) and radius $\sqrt{9}$ is : (A) $x^2+y^2-6x=0$ (B) $x^2-6x=9$ (C) $x^2+y^2=9$ (D) $9x^2+y^2=9$
16	Equation of directrix of parabola $y^2=-12x$ is : (A) $x=-3$ (B) $x=3$ (C) $y=3$ (D) $y=-3$
17	Co-vertices of ellipse $\frac{x^2}{b^2}+\frac{y^2}{a^2}=1$; $a>b$ are : (A) $(\pm a,0)$ (B) $(0,\pm a)$ (C) $(0,\pm b)$ (D) $(\pm b,0)$
18	Which of the following vectors is equal to the vector $\underline{i}.\underline{j}\times\underline{k}$: (A) 0 (B) 1 (C) -1 (D) $\underline{i}$
19	For what value of P [2 P 5] is perpendicular to [3 1 P] : (A) $\frac{2}{3}$ (B) -1 (C) 1 (D) $\sqrt{5}$
20	If $\underline{a}$ and $\underline{b}$ are parallel vectors then $\underline{a}\times\underline{b}=$: (A) 0 (B) 1 (C) -1 (D) 2

Roll No ______ Lahore Board-2024 ______ (To be filled in by the candidate)

(Academic Sessions 2020 – 2022 to 2022 – 2024)

MATHEMATICS — 224-1st Annual-(INTER PART – II) — Time Allowed : 2.30 hours

PAPER – II (Essay Type) — GROUP – II — Maximum Marks : 80

SECTION – I

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

(i) Given that $f(x)=\cos x$ find $\dfrac{f(a+h)-f(a)}{h}$ and simplify.

(ii) If $f(x)=(-x+9)^3$, find $f^{-1}(x)$

(iii) By rationalizing, find $\lim\limits_{x\to 0}\dfrac{\sqrt{x+a}-\sqrt{a}}{x}$

(iv) Write down the domain and range of $f(x)=2x-5$

(v) Calculate derivative of $f(x)=x^{2/3}$ at $x=8$

(vi) Find derivative of $\dfrac{1+x}{1-x}$ $w.r.t.\ x$

(vii) If $y=x^4+2x^2+2$, find $\dfrac{dy}{dx}$

(viii) Find $\dfrac{dy}{dx}$ of implicit function $x^2-4xy-5y=0$

(ix) Apply chain rule to find $\dfrac{dy}{du}$ if $y=x^2+\dfrac{1}{x^2}$ and $u=x-\dfrac{1}{x}$

(x) Differentiate $\sin^2 x$ $w.r.t$ $\cos^4 x$

(xi) Find $f'(x)$ if $f(x)=x^3 e^{\frac{1}{x}}$

(xii) Find y_2 if $y=x^2.e^{-x}$

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

(i) Using differential to find $\dfrac{dx}{dy}$ of $x^4+y^2=xy^2$

(ii) Evaluate $\int (2x+3)^{\frac{1}{2}}\,dx$

(iii) Evaluate $\int x\sqrt{x-a}\,dx$

(iv) Evaluate $\int (\ell nx)^2\,dx$

(v) Evaluate $\int_1^2 \left(x+\dfrac{1}{x}\right)^{\frac{1}{2}}\left(1-\dfrac{1}{x^2}\right)dx$

(vi) Find the area bounded by cos function from $x=-\dfrac{\pi}{2}$ to $x=\dfrac{\pi}{2}$

(vii) Solve $\dfrac{dy}{dx}+\dfrac{2xy}{2y+1}=x$

(viii) Find the mid-points of the line joining the two points A (– 8 , 3) , B (2 , – 1).

(ix) Find h such that the points A (– 1 , h) , B (3 , 2) and C (7 , 3) are collinear.

(x) In the triangle A (8 , 6) , B (– 4 , 2) , C (– 2 , – 6), find the slope of altitude of triangle.

(xi) Using slopes, show that the triangle with vertices A (6 , 1) , B (2 , 7) , C (– 6 , – 7) is a right triangle.

(xii) Find the point of intersection of the lines $\begin{aligned} x+4y-12&=0 \\ x-3y+3&=0 \end{aligned}$

 (Turn Over)

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

(i) Define feasible region.

(ii) Graph the solution set of $5x-4y\le 20$

(iii) Write the standard and general equation of circle.

(iv) Find centre and radius of $5x^2+5y^2+24x+36y+10=0$

(v) Check the position of the point (5 , 6) with respect to the circle $x^2+y^2=81$

(vi) Find the length of the tangent drawn from the point (– 5 , 4) to the circle $5x^2+5y^2-10x+15y-131=0$

(vii) Find foci and eccentricity of ellipse $x^2+4y^2=16$

(viii) Find the points of intersection of $x^2+y^2=8$ and $x^2-y^2=1$

(ix) If $\underline{u}=2\underline{i}-7\underline{j}$, $\underline{v}=\underline{i}-6\underline{j}$ and $\underline{w}=-\underline{i}+\underline{j}$, find $\frac{1}{2}\underline{u}+\frac{1}{2}\underline{v}+\frac{1}{2}\underline{w}$

(x) Find a vector whose magnitude is 4 and is parallel to $2\underline{i}-3\underline{j}+6\underline{k}$

(xi) Find α so that the vector $\underline{u}$ and $\underline{v}$ are perpendicular ; $\underline{u}=\alpha\underline{i}+2\alpha\underline{j}-\underline{k}$ and $\underline{v}=\underline{i}+\alpha\underline{j}+3\underline{k}$

(xii) Find the area of parallelogram whose vertices are A (1 , 2 , – 1) ; B (4 , 2 , – 3) ; C (6 , – 5 , 2) ; D (9 , – 5 , 0)

(xiii) Prove that $\underline{u}.(\underline{v}\times\underline{w})+\underline{v}.(\underline{w}\times\underline{u})+\underline{w}.(\underline{u}\times\underline{v})=3\underline{u}.(\underline{v}\times\underline{w})$

SECTION – II

Note : Attempt any THREE questions.

5. (a) Evaluate $\lim_{x\to 0}\frac{\sec x-\cos x}{x}$ 5

(b) Find the derivative w.r.t. x $\sin\sqrt{\frac{1+2x}{1+x}}$ 5

6. (a) If $y=(\cos^{-1}x)^2$, prove that $(1-x^2)y_2-xy_1-2=0$ 5

(b) Evaluate $\int\frac{2x}{1-\sin x}dx$ 5

7. (a) Find the area between the x-axis and the curve $y=\sqrt{2ax-x^2}$ when $a>0$ 5

(b) Maximize $f(x,y)=2x+5y$ subject to the constraints $2y-x\le 8$; $x-y\le 4$, $x\ge 0$, $y\ge 0$ 5

8. (a) Find equation of the circle passing through the points A (3 , – 1) , B (0 , 1) and having centre at $4x-3y-3=0$ 5

(b) Use vectors to prove that $\sin(\alpha-\beta)=\sin\alpha\cos\beta-\cos\alpha\sin\beta$ 5

9. (a) Mid-points of sides of triangle are (1 , – 1) , (– 4 , – 3) and (– 1 , 1). Find coordinates of vertices of triangle. 5

(b) Show that equation of parabola with focus at $(a\cos\alpha, a\sin\alpha)$ and directrix $x\cos\alpha+y\sin\alpha+a=0$ is $(x\sin\alpha-y\cos\alpha)^2=4a(x\cos\alpha+y\sin\alpha)$ 5

Paper Code Number: 4193	2024 (1^{st}-A) INTERMEDIATE PART-II (12^{th} Class)	Roll No:
MATHEMATICS PAPER-II GROUP-I		
TIME ALLOWED: 30 Minutes	OBJECTIVE	MAXIMUM MARKS: 20

Q.No.1 You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that bubble in front of that question number, on bubble sheet. Use marker or pen to fill the bubbles. Cutting or filling two or more bubbles will result in zero mark in that question.

S.#	QUESTIONS	A	B	C	D
1	Length of latus ractum of ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ is:	$\frac{2a^2}{b}$	$\frac{a^2}{b}$	$\frac{b^2}{a}$	$\frac{2b^2}{a}$
2	Equation of tangent to circle $x^2+y^2=a^2$ at (x_1, y_1) is:	$xx_1+yy_1=a^2$	$xx_1-yy_1=a^2$	$xy_1+x_1y=a^2$	$xy_1-x_1y=a^2$
3	If α, β, γ are direction cosines of a vector then $\cos^2\alpha+\cos^2\beta+\cos^2\gamma=?$	3	1	2	0
4	For what value of 'α' vectors $5\hat{i}-\hat{j}+\hat{k}$ and $\alpha\hat{i}+3\hat{j}-3\hat{k}$ are parallel to each other:	-3	15	-15	3
5	If any two vectors of scalar triple product are equal then value is:	1	-1	2	0
6	$\lim_{n\to\infty}\left(1+\frac{1}{n}\right)^{2n}=?$	e^{-1}	$e^{\frac{1}{2}}$	e^2	e^3
7	The function $f(x)=\frac{x^2+1}{x-1}$ is discontinuous at:	$x=2$	$x=0$	$x=-1$	$x=1$
8	Derivative of x^0 with respect to 'x' is:	0	[illegible]	1	c
9	$\frac{d}{dx}[fog(x)]=?$	$f'[g(x)]$	$f[g'(x)]$	$f'[g(x)]g'(x)$	$f[g(x)]g'(x)$
10	Geometrically $\frac{dy}{dx}$ means	Tangent of slope	Slope of line	Slope of $x-$axis	Slope of tangent
11	$\lim_{h\to 0}\frac{f(a+h)-f(a)}{h}=?$	$f'(a)$	$f'(x)$	$f'(a+h)$	$f(a)$
12	$\int\frac{f'(x)}{f(x)}dx=?$	$\ell n\|x\|+c$	$\ell n\|f(x)\|+c$	$\ell n\|f'(x)\|+c$	$f(x)$
13	$\int(ax+b)^n dx$ where $n\neq-1$ is:	$\frac{(ax+b)^{n+1}}{n+1}+c$	$\frac{(ax+b)^{n+1}}{a}+c$	$\frac{(ax+b)^{n+1}}{a(n+1)}+c$	$\frac{(ax+b)^{n+1}}{n}+c$
14	$\int 2^x dx=?$	$x2^{x-1}+c$	$2^x\ell n2+c$	$\frac{2^{x+1}}{x+1}+c$	$\frac{2^x}{\ell n2}+c$
15	When expression $\sqrt{a^2-x^2}$ involve in integration, we substitute:	$x=a\sin\theta$	$x=a\sec\theta$	$x=a\tan\theta$	$x=\sin\theta$
16	All points (x,y) with $x<0$, $y<0$ lies in quadrant:	I	II	III	IV
17	Slope of line passing through points $A(x_1, y_1)$ and $B(x_2, y_2)$ is:	$\frac{x_2-x_1}{y_2-y_1}$	$\frac{y_2+y_1}{x_2+x_1}$	$\frac{y_2-x_2}{y_1-x_1}$	$\frac{y_2-y_1}{x_2-x_1}$
18	Equation of vertical line through points $(3,-5)$ is:	$y=-5$	$y=5$	$x=3$	$x=-3$
19	Which of the following ordered pair does not satisfy $4x-3y<2$:	(1, 1)	(3, 0)	(–2, 1)	(0, 0)
20	Radius of circle $x^2+y^2=5$ is:	5	25	$\sqrt{5}$	$\frac{5}{2}$

INTERMEDIATE PART-II (12^{th} Class)	2024 (1^{st}-A)	Roll No: ________
MATHEMATICS PAPER-II GROUP-I		
TIME ALLOWED: 2.30 Hours	SUBJECTIVE	MAXIMUM MARKS: 80

NOTE: Write same question number and its parts number on answer book, as given in the question paper.

SECTION-I

2. Attempt any eight parts. $8\times 2=16$

(i)	Discuss continuity of $g(x)=\dfrac{x^2-9}{x-3}$, $x\neq 3$ at $x=3$	(ii)	Determine whether $f(x)=\sin x+\cos x$ is even or odd function.
(iii)	Define Constant Function. Give one example also.	(iv)	Find $f^{-1}(x)$, when $f(x)=\dfrac{2x+1}{x-1}$ where $x>1$
(v)	Differentiate $\left(\sqrt{x}-\dfrac{1}{\sqrt{x}}\right)^2$ w.r.t 'x'.	(vi)	Find $\dfrac{dy}{dx}$, if $y^2+x^2-4x=5$
(vii)	Find derivative of $x^2-\dfrac{1}{x^2}$ w.r.t. x^4	(viii)	Prove that $\dfrac{d}{dx}[\cot^{-1}x]=-\dfrac{1}{1+x^2}$, $x\in R$
(ix)	Determine the values of x for which f defined as $f(x)=x^2+2x-3$ is increasing.	(x)	Define Taylor series expansion of function f at $x=a$
(xi)	Find y_2, if $y=\ln\left(\dfrac{2x+3}{3x+2}\right)$	(xii)	Find $\dfrac{dy}{dx}$, if $y=xe^{\sin x}$

3. Attempt any eight parts. $8\times 2=16$

(i)	Find dy if $y=x^2+2x$ and x changes from 2 to 1.8.	(ii)	Evaluate $\int\dfrac{dx}{\sqrt{x}(\sqrt{x}+1)}$
(iii)	Evaluate $\int\cos 3x\ \sin 2x\ dx$	(iv)	Evaluate $\int\sec x\ dx$
(v)	Evaluate $\int x^2\ln x\ dx$	(vi)	Evaluate $\int_0^{\pi/4}\sec x(\sec x+\tan x)\,dx$
(vii)	Solve the differential equation $\dfrac{dy}{dx}=\dfrac{y^2+1}{e^{-x}}$	(viii)	Show that the points $A(3,1)$, $B(-2,-3)$ and $C(2,2)$ are vertices of an isosceles triangle.
(ix)	Find slope and inclination of the line joining the points $(3,-2)$ and $(2,7)$.		
(x)	Find an equation of the line through $(-5,-3)$ and $(9,-1)$.		
(xi)	Convert the equation $15y-8x+3=0$ into normal form.		
(xii)	Find the angle from the line with slope $\dfrac{-7}{3}$ to the line with slope $\dfrac{5}{2}$.		

4. Attempt any nine parts. $9\times 2=18$

(i)	What are Decision Variables?	(ii)	Draw the graph of inequality $2x+3y\le 12$
(iii)	Find the centre and radius of the circle $x^2+y^2-6x+4y+13=0$		
(iv)	Check the position of the point $(5,6)$ with respect to the circle $x^2+y^2=81$		
(v)	Find the focus and directix of the parabola $x^2=4(y-1)$.		
(vi)	Write an equation of the ellipse with centre $(0,0)$ focus $(0,-3)$, vertex $(0,4)$.		
(vii)	Find foci and eccentricity of $x^2-y^2=9$		
(viii)	Find the length of the tangent drawn from the point $P(-5,10)$ to the circle $5x^2+5y^2+14x+12y-10=0$		
(ix)	Write the direction cosines of $\underline{v}=2\underline{i}+3\underline{j}+4\underline{k}$.		
(x)	Find a vector whose magnitude is 4 and parallel to $2\underline{i}-3\underline{j}+6\underline{k}$		
(xi)	Find $\underline{b}\times\underline{a}$ where $\underline{a}=3\underline{i}-2\underline{j}+\underline{k}$, $\underline{b}=\underline{i}+\underline{j}$		
(xii)	Find the value of $3\underline{i}\cdot\underline{k}\times\underline{i}$	(xiii)	If $\underline{a}+\underline{b}+\underline{c}=0$, then prove that $\underline{a}\times\underline{b}=\underline{b}\times\underline{c}$

SECTION-II

NOTE: Attempt any three questions. $3\times 10=30$

5.(a)	Show that $\lim\limits_{x\to 0}\dfrac{a^x-1}{x}=\log_e a$	(b)	If $x=a\cos^3\theta$, $y=b\sin^3\theta$, show that: $a\dfrac{dy}{dx}+b\tan\theta=0$
6.(a)	If $y=(\cos^{-1}x)^2$, prove that $(1-x^2)y_2-xy_1-2=0$	(b)	Show that $\int\sqrt{a^2-x^2}\,dx=\dfrac{a^2}{2}\sin^{-1}\dfrac{x}{a}+\dfrac{x}{2}\sqrt{a^2-x^2}+c$
7.(a)	Evaluate $\int_0^{\sqrt{3}}\dfrac{x^3+9x+1}{x^2+9}\,dx$	(b)	Maximize $f(x,y)=2x+5y$ subject to the constraints $2y-x\le 8$, $x-y\le 4$, $x\ge 0$, $y\ge 0$
8.(a)	Write an equation of the circle that passes through $A(-7,7)$, $B(5,-1)$, $C(10,0)$		
(b)	Prove that in any triangle ABC $a=b\cos C+c\cos B$		
9.(a)	Find the focus, vertex and directix of the parabola $x^2-4x-8y+4=0$		
(b)	The midpoints of the sides of a triangle are $(1,-1)$, $(-4,-3)$ and $(-1,1)$. Find coordinates of the vertices of the triangle.		

Paper Code Number: 4196	2024 (1st-A) INTERMEDIATE PART-II (12th Class)	Roll No: Multan Board-2024

MATHEMATICS PAPER-II GROUP-II

TIME ALLOWED: 30 Minutes	OBJECTIVE	MAXIMUM MARKS: 20

Q.No.1 You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that bubble in front of that question number, on bubble sheet. Use marker or pen to fill the bubbles. Cutting or filling two or more bubbles will result in zero mark in that question.

S.#	QUESTIONS	A	B	C	D
1	The equation of directix of the parabola $x^2=-16y$ is:	$y+4=0$	$y-4=0$	$x+4=0$	$x-4=0$
2	The eccentricity of $\frac{y^2}{4}-x^2=1$ is:	$\frac{\sqrt{5}}{2}$	$\frac{2}{\sqrt{5}}$	$\frac{-2}{\sqrt{5}}$	2
3	$3\hat{i}\cdot(2\hat{j}\times\hat{k})=?$	0	2	3	6
4	$Cos\,\theta$ equal to:	$\hat{a}\times\hat{b}$	$\hat{a}\cdot\hat{b}$	$\lvert\hat{a}\times\hat{b}\rvert$	$\underline{a}\times\underline{b}$
5	The length of the vector $2\hat{i}-2\hat{j}-\hat{k}$ is:	3	4	5	2
6	The function $x^2+xy+y^2=2$ of x and y is:	Constant	Even	Implicit	Explicit
7	If $f(x)=2x-8$, then $f^{-1}(x)=?$	$8-2x$	$8+2x$	$\frac{x-8}{2}$	$\frac{x+8}{2}$
8	$\frac{d}{dx}(3^x)=?$	$\frac{3^x}{\ell n3}$	$x\,\ell n3$	$3^x\,\ell n3$	$3^x\,\ell nx$
9	If $y=\cos^{-1}\frac{x}{a}$, then $\frac{dy}{dx}=?$	$\frac{-1}{\sqrt{a^2-x^2}}$	$\frac{-a}{\sqrt{x^2+a^2}}$	$\frac{a}{\sqrt{x^2-a^2}}$	$\frac{a}{\sqrt{a^2-x^2}}$
10	$\frac{d}{dx}(\cos x)=?$	$\sin x$	$-\sec x$	$\sec x$	$-\sin x$
11	If $y=\cos^{-1}\frac{x}{a}$, then $\cos y=?$	x	$\frac{x}{a}$	$\frac{y}{a}$	$\sin y$
12	$\int_0^{\pi}\sin x\,dx=?$	$\cos\pi$	0	1	2
13	$\int\tan x\,dx=?$	$\ln\lvert\sec x\rvert+c$	$\ln\lvert\cos ec\,x\rvert+c$	$\ln\lvert\sin x\rvert+c$	$\ln\lvert\cot x\rvert+c$
14	$\int\frac{e^x}{e^x+5}dx=?$	$(e^x+5)+c$	$\ln(e^x+5)+c$	$e^{2x}+5$	$e^{2x}+7+c$
15	$\int-\cos ec^2x\,dx=?$	$\cos x+c$	$\tan x+c$	$\cos ec\,x+c$	$\cot x+c$
16	If α is the inclination of line ℓ, then $\frac{x-x_1}{cox\alpha}=\frac{y-y_1}{\sin\alpha}=r\,(say)$ is called:	Point-slope form	Normal form	Symmetric form	Two-points form
17	Equation of line bisecting first and third quadrant is:	$x=0$	$y=0$	$y=-x$	$y=x$
18	The perpendicular distance of line $3x+4y-15=0$ from the origin is:	3	2	1	0
19	The graph of $2x\geq 4$ lies in:	Upper Half Plane	Lower Half Plane	Left Half Plane	Right Half Plane
20	Radius of circle $x^2+y^2=5$ is:	5	-5	$\sqrt{5}$	25

INTERMEDIATE PART-II (12th Class)	2024 (1st-A)	Roll No:
MATHEMATICS PAPER-II GROUP-II		
TIME ALLOWED: 2.30 Hours	SUBJECTIVE	MAXIMUM MARKS: 80

NOTE: Write same question number and its parts number on answer book, as given in the question paper.

SECTION-I

2. Attempt any eight parts. $8 \times 2 = 16$

(i) Define Implicit Function.

(ii) Without finding the inverse, state the domain and range of f^{-1} $f(x)=\sqrt{x+2}$

(iii) Prove that $\lim_{x\to 0}(1+x)^{\frac{1}{x}} = e$

(iv) Evaluate $\lim_{x\to 0}\frac{\sin x^0}{x}$

(v) Find by definition, derivative of $2x^2+1$ with respect to x

(vi) Differentiate with respect to 'x' $\frac{x^2+1}{x^2-3}$

(vii) Find $\frac{dy}{dx}$ if $y^2-xy-x^2+4=0$

(viii) Find $\frac{dy}{dx}$ if $x=y\sin y$

(ix) Find $f'(x)$ if $f(x)=x^3e^{\frac{1}{x}}$, $x\neq 0$

(x) Find y_2 if $y=\ln\left(\frac{2x+3}{3x+2}\right)$

(xi) By Maclaurin's series, show that $\cos x = 1-\frac{x^2}{2!}+\frac{x^4}{4!}-\frac{x^6}{6!}+$ ______

(xii) Determine in which interval 'f' is increasing or decreasing for domain mentioned $f(x)=4-x^2$, $x\in(-2,2)$

3. Attempt any eight parts. $8 \times 2 = 16$

(i) Find δy and dy in $y=x^2-1$ where x changes from 3 to 3.02.

(ii) Evaluate the integral $\int\frac{1}{x^2+4x+13}dx$

(iii) Evaluate the integral $\int x\ln x\,dx$

(iv) Evaluate $\int_{-2}^{0}\frac{1}{(2x-1)^2}dx$

(v) Find the area bounded by the curve $y=x^3+3x^2$ and the $x-$axis.

(vi) Solve the differential equation $\sin y\ \operatorname{cosec} x\ \frac{dy}{dx}=1$

(vii) Find the general solution of the equation $\frac{dy}{dx}-x=xy^2$

(viii) Show that the points $A(3,1)$, $B(-2,-3)$ and $C(2,2)$ are vertices of an isosceles triangle.

(ix) The $xy-$coordinate axes are rotated about the origin through the indicated angle and the new axes are OX and OY. Find the $xy-$coordinates of P with the given $XY-$coordinates $P(-5,3)$; $\theta=30^\circ$

(x) Write down an equation of the straight line passing through (5, 1) and parallel to a line passing through the points $(0,-1)$, $(7,-15)$

(xi) Find the point of intersection of the lines $5x+7y=35$, $3x-7y=21$

(xii) Find an equation of the line with $x-$intercept -3 and $y-$intercept 4.

4. Attempt any nine parts. $9 \times 2 = 18$

(i) Define Feasible Solution.

(ii) Graph the inequality $x+2y<6$

(iii) Find the equation of the circle with centre at $(\sqrt{2},-3\sqrt{3})$ and radius $2\sqrt{2}$.

(iv) Find focus and directix of the parabola $y^2=-8(x-3)$

(v) Find length of tangent from the point $(-5,10)$ to the circle $5x^2+5y^2+14x+12y-10=0$

(vi) Find the centre and the foci of ellipse $9x^2+y^2=18$

(vii) Write equation of hyperbola with foci $(\pm5,0)$ and vertex (3, 0).

(viii) Define Conic Section.

(ix) Find the vector from the point A to the origin where $\overrightarrow{AB}=4\underline{i}-2\underline{j}$ and B is the point $(-2,5)$.

(x) If $|\alpha\underline{i}+(\alpha+1)\underline{j}+2\underline{k}|=3$. Find the value of α.

(xi) Show that the vectors $3\underline{i}-2\underline{j}+\underline{k}$, $\underline{i}-3\underline{j}+5\underline{k}$ and $2\underline{i}+\underline{j}-4\underline{k}$ form a right angle.

(xii) If $\underline{a}+\underline{b}+\underline{c}=0$, then prove that $\underline{a}\times\underline{b}=\underline{b}\times\underline{c}$

(xiii) A force $\underline{F}=2\underline{i}+\underline{j}-3\underline{k}$ acting at a point $A(1,-2,1)$. Find the moment of $\underline{F}$ about the point $B(2,0,-2)$

SECTION-II

NOTE: Attempt any three questions. $3 \times 10 = 30$

5.(a) If $f(x)=\begin{cases}\frac{\sqrt{2x+5}-\sqrt{x+7}}{x-2}, & x\neq 2\\ k, & x=2\end{cases}$

Find value of 'k' so that 'f' is continuous at $x=3$.

(b) Show that $\frac{dy}{dx}=\frac{y}{x}$ if $\frac{y}{x}=\tan^{-1}\frac{x}{y}$

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

(b) Evaluate $\int\sqrt{3-4x^2}\,dx$

7.(a) Evaluate $\int_0^{\sqrt{3}}\frac{x^3+9x+1}{x^2+9}dx$

(b) Graph the feasible region of the following system of linear inequalities and find the corner points.
$2x+3y\leq 18$, $2x+y\leq 10$, $x+4y\leq 12$, $x\geq 0$, $y\geq 0$

8.(a) Find volume of the tetrahedron with vertices $A(2,1,8)$, $B(3,2,9)$, $C(2,1,4)$ and $D(3,3,10)$

(b) Write equations of two tangents from (2, 3) to the circle $x^2+y^2=9$

9.(a) Show that the equation $9x^2-18x+4y^2+8y-23=0$ represents an ellipse. Find its elements.

(b) Find an equation of medians of the triangle whose vertices are $A(-3,2)$, $B(5,4)$ and $C(3,-8)$

Rawalpindi Board-2024

Roll No to be filled in by the candidate

HSSC-(P-II)- A-2024

(For All Sessions)

(GROUP-I)

Paper Code | 8 | 1 | 9 | 5

Mathematics (Objective)

Time: 30 Minutes   Marks : 20

Note: Write Answers to the Questions on the objective answer sheet provided. Four possible answers A, B, C and D to each question are given. Which answer you consider correct, fill the corresponding circle A, B, C or D given in front of each question with Marker or Pen ink on the answer sheet provided.

		(A)	(B)	(C)	(D)
1.1	Midpoint of $A(2,0), B(0,2)$ is:	$(0,2)$	$(2,0)$	$(2,2)$	$(1,1)$
2.	The ___ point satisfies $x+2y<6$	$(4,1)$	$(3,1)$	$(1,3)$	$(1,4)$
3.	In a conic, the ratio of the distance from a fixed point to the distance from a fixed line is:	Focus	Vertex	Ecentricity	Centre
4.	Standard equation of Parabola is:	$y^2=4ax$	$x^2+y^2=a^2$	$\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$	$\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$
5.	Equation of tangent to circle $x^2+y^2=a^2$ at $P(x_1,y_1)$ is:	$xx_1+yy_1=a^2$	$xx_1-yy_1=a^2$	$xy_1+yx_1=a^2$	$xy_1-yx_1=a^2$
6.	The volume of parallelopiped =____.	$(\underline{u}\times\underline{v}).\underline{\omega}$	$(\underline{u}\times\underline{v})\times\underline{\omega}$	$\underline{u}\times(\underline{v}\times\underline{\omega})$	$\underline{u}\times(\underline{u}\times\underline{v})$
7.	The non-zero vectors are perpendicular when:	$\underline{u}.\underline{v}=1$	$\lvert\underline{u}.\underline{v}\rvert=1$	$\underline{u}.\underline{v}=0$	$\underline{u}.\underline{v}\neq 0$
8.	$\underline{j}\times\underline{k}=$ ______.	$\underline{i}$	$-\underline{i}$	0	$\underline{k}$
9.	The range of $f(x)=2+\sqrt{x-1}$ is:	$[1,+\infty)$	$[2,+\infty)$	$(1,+\infty)$	$(2,+\infty)$
10.	The perimeter P of square as a function of its area A:	$3\sqrt{A}$	$4\sqrt{A}$	$\sqrt{A}$	$2\sqrt{A}$
11.	If $f(x)=\frac{1}{x^2}$ then $f'(3)=$ ______.	$\frac{1}{9}$	$\frac{2}{3}$	$\frac{-2}{27}$	$\frac{1}{27}$
12.	If $f'(c)=0$ & $f''(c)>0$ then C is point of:	Maxima	Minima	Inflection	Constant
13.	$\frac{d}{dx}(\log_a x)=$ ____.	$\frac{1}{x\ln a}$	$\frac{\ln a}{x}$	$\frac{1}{x}$	$\frac{-1}{x\ln a}$
14.	$\frac{d}{dx}(\cot ax)=$ ____.	$\operatorname{cosec}^2 ax$	$a\operatorname{cosec}^2 ax$	$-a\operatorname{cosec}^2 ax$	$-a\operatorname{cosec} ax$
15.	$\int\frac{1}{\sqrt{1-x^2}}dx=$ ____.	$\sin^{-1}x+c$	$\cos^{-1}x+c$	$-\sin^{-1}x+c$	$-\cos^{-1}x+c$
16.	$\int\frac{1}{x}dx=$ ____.	$\ln x+c$	$\frac{1}{x^2}+c$	$-\frac{1}{x^2}+c$	$\frac{1}{x}+c$
17.	The solution of differential equation $\frac{dy}{dx}=-y$ is:	$y=xe^{-x}$	$y=ce^{-x}$	$y=e^x$	$y=ce^x$
18.	$\int_0^1\frac{1}{1+x^2}dx=$ ____.	$\frac{\pi}{4}$	$\frac{2\pi}{3}$	$\frac{3\pi}{4}$	π
19.	x – intercept of the line $2x+5y-1=0$ is:	2	3	$\frac{1}{2}$	$\frac{1}{5}$
20.	Slope of $y-axis$ is:	0	1	-1	Undefined

617-12-A

Roll No ________ to be filled in by the candidate

HSSC-(P-II)-A/2024
(For All Sessions)
(GROUP-I)
SECTION-I

Marks : 80

Mathematics (Subjective)

Time: 2:30 hours

2. Write short answers of any eight parts from the following: (8x2=16)

i. If $f(x) = 2x+1$, then find $fof\ (x)$.

ii. Express the area A of a circle as a function of its circumference C.

iii. Evaluate $\lim\limits_{h\to 0}\frac{\sqrt{x+h}-\sqrt{x}}{h}$

iv. Define continuous function.

v. Differentiate $\left(\sqrt{x}-\frac{1}{\sqrt{x}}\right)^2$ $w.r.t\ x$

vi. Find $\frac{dy}{dx}$ if $y^2 - xy - x^2 + 4 = 0$

vii. Differentiate $x^2 sec4x w.r.t\ x$

viii. Differentiate $sin^2x w.r.t.\ cos^4x$

ix. Find $f'(x)$ if $f\ (x) = e^x(1+lnx)$

x. Find y_2 if $y = ln(x^2-9)$

xi. Prove that $ln(1+x) = x - \frac{x^2}{2}+\frac{x^3}{3}-\frac{x^4}{4}+\cdots$

xii. Determine the interval in which $f(x) = cosx$ is decreasing; $x \in \left(-\frac{\pi}{2},\frac{\pi}{2}\right)$.

3. Write short answers of any eight parts from the following: (8x2=16)

i. Solve the differential equation $sec^2 x\ tan\ y\ dx + sec^2y \tan x\ dy = 0$

ii. Find the area between $x-axis$ and the curve $y = x^2+1$ from $x = 1$ to $x = 2$

iii. Evaluate: $\int_1^e x\ lnx\ dx$

iv. Evaluate the integral $\int \frac{-2x}{\sqrt{4-x^2}}dx$

v. Evaluate: $\int \left(\sqrt{x}-\frac{1}{\sqrt{x}}\right)^2 dx$

vi. Evaluate the integral $\int (a-2x)^{3/2}\,dx$

vii. Find the approximate change in the volume of a cube if length of its each edge changes from 5 to 5.02.

viii. Show that the points $A(0,2), B(\sqrt{3},-1)$ and $C(0,-2)$ are vertices of a right triangle.

ix. Convert the equation of line $4x+7y-2=0$ into normal form.

x. Fine the angle from the line with slope $\frac{-7}{3}$ to the line with slope $\frac{5}{2}$.

xi. Find the pair of lines represented by $3x^2+7xy+2y^2=0$.

xii. Find the point of intersection of lines $3x+y+12=0$ and $x+2y-1=0$.

4. Write short answers of any nine parts from the following: (9x2=18)

i. Define feasible region.

ii. Graph the solution set of in-equality $3x+7y \geq 21$.

iii. Find equation of circle with ends of diameter at $(-3, 2)$ and $(5, -6)$.

iv. Write down equation of tangent to the circle $x^2+y^2 = 25$ at $(5\ cos\theta, 5\ sin\theta)$

v. Find focus and vertex of Parabola $x^2 = 4(y-1)$

vi. Find equation of ellipse with data Foci $(\pm 3, 0)$ Minor axis of length 10.

vii. Find center of hyperbola $x^2-y^2+8x-2y-10=0$

Rawalpindi Board-2024

viii. Find equation of Normal to $y^2 = 4ax$ at $(at^2, 2at)$.

ix. Find the sum of vector $\overrightarrow{AB}$ and $\overrightarrow{CD}$ given four points $A(1,-1)B(2,0)C(-1,3)$ and $D(-2,2)$

x. Find $\propto$, so that $|\propto \underline{i} + (\propto +1)\underline{j} + 2\underline{k}|=3$

xii. If $\underline{v}$ is a vector for which $\underline{v}.\underline{i} = 0\underline{v}.\underline{j} = 0\underline{v}.\underline{k} = 0$, find $\underline{v}$

xii. Find the area of triangle determined by the points $P(0,0,0)$ $Q(2,3,2)$ and $R(-1,1,4)$

xiii. Find the value of $2\hat{\imath} \times 2\hat{\jmath}.\hat{k}$

SECTION-II

Note Attempt any three questions. Each question carries equal marks: (10x3=30)

5. (a) Find the values of m and n, so that given function f is continuous at $x = 3$ when (05)

$$f(x) = \begin{cases} mx, & if\ x < 3 \\ n, & if\ x = 3 \\ -2x+9, & if\ x > 3 \end{cases}$$

(b) Find $\frac{dy}{dx}$, when $x = \frac{a(1-t^2)}{1+t^2}, y = \frac{2bt}{1+t^2}$ (05)

6. (a) If $y = (cos^{-1}x)^2$, prove that $(1-x^2)y_2 - xy_1 - 2 = 0$. (05)

(b) Evaluate the integral $\int e^x sinx\ cosx\ dx$. (05)

7. (a) Solve the differential equation $y - x\frac{dy}{dx} = 3\left(1 + x\frac{dy}{dx}\right)$. (05)

(b) Graph the feasible region and corner points of the inequalities (05)

$$2x + y \leq 10; \quad x + 4y \leq 12; x + 2y \leq 10;$$

8. (a) Show that the circles: $x^2 + y^2 + 2x - 8 = 0$; $x^2 + y^2 - 6x + 6y - 46 = 0$ touch internally. (05)

(b) Using vector method, for any triangle ABC, prove that: $c^2 = a^2 + b^2 - 2ab\ cosC$. (05)

9. (a) Find the focus, vertex and directrix of the Parabola; $x^2 = 4(y-1)$ (05)

(b) Find the lines represented by $3x^2 + 7xy + 2y^2 = 0$ and also find measure of the angle between them. (05)

618-12-A

Rawalpindi Board-2024

☆☆	Roll No	HSSC-(P-II)- A-2024 (For All Sessions)	Paper Code	8	1	9	4

Mathematics (Objective) (GROUP-II)

Time: 30 Minutes   Marks : 20

Note: Write Answers to the Questions on the objective answer sheet provided. Four possible answers A, B, C and D to each question are given. Which answer you consider correct, fill the corresponding circle A, B, C or D given in front of each question with Marker or Pen ink on the answer sheet provided.

1.1	If $r = 0$, the circle is called:	(A)	Unit circle	(B)	Circle	(C)	Ellipse	(D)	Point circle
2.	$[\underline{i}\ \ \underline{i}\ \ \underline{k}] =$	(A)	$\underline{i}$	(B)	$-\underline{i}$	(C)	1	(D)	0
3.	If $\underline{u} = 2\underline{i} - \underline{j} + \underline{k}$, $\underline{v} = 4\underline{i} + 2\underline{j} - \underline{k}$ then $\underline{u} \times \underline{u} =$	(A)	u^2	(B)	0	(C)	1	(D)	2
4.	If $\underline{u}, \underline{v}$ are two non-zero vectors, then area of parallelogram =	(A)	$\lvert\underline{u} \times \underline{v}\rvert$	(B)	$\frac{1}{2}\lvert\underline{u} \times \underline{v}\rvert$	(C)	$\frac{1}{6}\lvert\underline{u} \times \underline{v}\rvert$	(D)	$\frac{1}{2}(\underline{u} \times \underline{v})$
5.	If k is any real number, $\lim_{x\to a}[kf(x)] =$	(A)	$\lim_{x\to a} f(x)$	(B)	$\lim_{x\to a} k$	(C)	$k \lim_{x\to a} f(x)$	(D)	$f(x)$
6.	If $(fx) = x + 3$ then: $\lim_{x\to 3} f(x) =$	(A)	6	(B)	0	(C)	-3	(D)	3
7.	If $y = e^{f(x)}$ then $\frac{dy}{dx} =$	(A)	$e^{f(x)}$	(B)	$f(x)e^{f(x)}$	(C)	$f(x)e^{f(x)}$	(D)	$f'(x)e^{f(x)}$
8.	Derivative of $x\sqrt{x^2+3}$ $w.r.t$ x is:	(A)	$\frac{2x^2+3}{\sqrt{x^2+3}}$	(B)	$\frac{3x}{2\sqrt{x^2+3}}$	(C)	$\frac{3x^2+3}{x\sqrt{x^2+3}}$	(D)	$\frac{3x^2+3}{2x\sqrt{x^2+3}}$
9	Derivative of $\tanh(x^2)$ is:	(A)	$2x\, sech^2 x$	(B)	$2\, sech^2 x^2$	(C)	$2x\, sech^2 x^2$	(D)	$sech^2 x^2$
10.	Derivative of "x" $w.r.t$ "x" is:	(A)	x^2	(B)	2	(C)	0	(D)	1
11.	In integration, substitution of $\sqrt{4-x^2}$ is:	(A)	$x = \sin\theta$	(B)	$x = 2\sin\theta$	(C)	$x = \sin 2\theta$	(D)	$x = 2\cos\theta$
12.	$\int Tan\, x\, dx =$	(A)	$\ln\cos x + c$	(B)	$\frac{1}{\ln\cos x} + c$	(C)	$-\ln\lvert\cos x\rvert + c$	(D)	$Sec^2 x + c$
13.	Solution of differential equation: $(e^x + e^{-x})\frac{dy}{dx} = e^x - e^{-x}$ is:								
		(A)	$-\ln(e^x + e^{-x}) + c$	(B)	$\ln(e^x - e^{-x}) + c$	(C)	$\ln(e^x + e^{-x}) + c$	(D)	$\frac{(e^x + e^{-x})^2}{2}$
14.	$\int Sinx Cos\, x\, dx =$	(A)	$\frac{Sin^2 x}{2} + c$	(B)	$\frac{Cos^2 x}{2} + c$	(C)	$-Sin\, x + c$	(D)	$Cosx + c$
15.	The line: $ay + b = 0$ is	(A)	Parallel to y-axis	(B)	Parallel to x-axis	(C)	Passing through origin	(D)	Lies in Quad. I
16.	The slope of line joining the points $(-2,4)$; $(5,11)$ is:	(A)	1	(B)	-1	(C)	45°	(D)	$-45°$
17.	The location of the plane of the point $P(x,y)$ for which $y = 0$ at:	(A)	Origin	(B)	$y-axis$	(C)	$x-axis$	(D)	Ist Quad
18.	The maximum and minimum values occur at:	(A)	Corner point	(B)	Any point	(C)	Convex region	(D)	Corner points of feasible region
19.	The line intersect the circle at:	(A)	One point	(B)	Two points	(C)	Infinite points	(D)	More than two points
20.	Diameter of circle: $x^2 + y^2 = 16$ is:	(A)	8	(B)	4	(C)	16	(D)	32

619-12-A

Roll No ________ to be filled in by the candidate

HSSC-(P-II)-A/2024

(For All Sessions)

(GROUP-II)

Marks : 80

Time: 2:30 hours

Mathematics (Subjective)

SECTION-I

2. Write short answers of any eight parts from the following: (8x2=16)

i. Define even function with example.

ii. Find $fog(x)$ if $f(x) = 2x + 1, g(x) = \frac{3}{x-1}, x \neq 1$.

iii. Evaluate: $\lim_{x \to 2} \frac{\sqrt{x}-\sqrt{2}}{x-2}$.

iv. Prove that $Sinh2x = 2\, Sinhx\, Coshx$.

v. Find $\frac{dy}{dx}$ from first principles if $y = \frac{1}{\sqrt{x+a}}$.

vi. Differentiate $w.r.t\ x$; $\frac{(x^2+1)^2}{x^2-1}$

vii. Find $\frac{dy}{dx}$ if $x^2 - 4xy - 5y = 0$.

viii. Differentiate w.r.t θ; $tan^3\theta\, sec^2\theta$.

ix. Find $\acute{f}(x)$ if $f(x) = x^3 e^{1/x}$.

x. Find y_2 if $y = 2x^5 - 3x^4 + 4x^3 + x - 2$.

xi. Apply Maclaurin Series expansion to prove that: $cosx = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \cdots$

xii. Find extreme values for $f(x) = 3x^2$

3. Write short answers of any eight parts from the following: (8x2=16)

i. Evaluate $\int x\sqrt{x^2-1}\, dx$

ii Use differentials to approximate the value of $(31)^{\frac{1}{5}}$

iii. Evaluate: $\int \frac{x}{\sqrt{4+x^2}} dx$

iv. Evaluate the integral $\int \frac{e^{m\tan^{-1}x}}{1+x^2} dx$

v. Evaluate: $\int_1^2 \frac{x}{x^2+2} dx$

vi. Find the area between $x-$ $axis$ and the curve $y = 4x - x^2$

vii. Solve the differential equation $\frac{1}{x}\frac{dy}{dx} = \frac{1}{2}(1 + y^2)$

viii. The points $A(-5, -2)$ and $B(5, -4)$ are ends of a diameter of a circle. Find the centre and radius of circle.

ix. The coordinates of a point p are $(-6, 9)$. The axes are translated through the point $\acute{O}(-3, 2)$. Find the coordinates of p referred to the new axes.

x. Check whether the origin and the point $p(5, -8)$ lies on the same side or on the opposite sides of the line $3x + 7y + 15 = 0$

xi. By means of slopes, show that the following points lie on the same line $(-4, 6)$; $(3, 8)$; $(10, 10)$.

xii. Determine the value of p such that the lines $2x - 3y - 1 = 0$, $3x - y - 5 = 0$ and $3x + py + 8 = 0$ meet at a point.

4. Write short answers of any nine parts from the following: (9x2=18)

i. Graph the solution set of $3y - 4 \leq 0$ in $xy-$ plane.

ii. Define convex region.

iii. Find an equation of circle of radius a and lying in the second quadrant tangent to both the axes.

iv. Find center and radius of circle $5x^2 + 5y^2 + 24x + 36y + 10 = 0$.

v. Write down equation of normal to the circle $x^2 + y^2 = 25$ at $(4, 3)$.

vi. Find vertex and directrix of the parabola $y^2 = -12x$.

vii. Find the point of intersection of conics $x^2 + y^2 = 8$ and $x^2 - y^2 = 1$.

viii. Find center and foci of hyperbola $\frac{y^2}{4} - x^2 = 1$.

ix. Find a vector of magnitude 4 and is parallel to $2\underline{i} - 3\underline{j} + 6\underline{k}$.

x. Find direction cosines of $\overrightarrow{PQ}$ where $P = (2, 1, 5)$ and $Q = (1, 3, 1)$.

xi. Find volume of parallelopiped whose edges are $\underline{u} = \underline{i} - 2\underline{j} + 3\underline{k}$, $\underline{v} = 2\underline{i} - \underline{j} - \underline{k}$ and $\underline{w} = \underline{j} + \underline{k}$

xii. Find the value of $[\underline{k}\ \ \underline{i}\ \ \underline{j}]$.

xiii. Find $\propto$ so that $\underline{u} = \propto \underline{i} + 2 \propto \underline{j} - \underline{k}$ and $\underline{v} = \underline{i} + \propto \underline{j} + 3\underline{k}$ are perpendicular.

Rawalpindi Board-2024

SECTION-II

Note Attempt any three questions. Each question carries equal marks: (10x3=30)

5. (a) Evaluate: $\lim_{\theta \to o} \frac{tan\theta - sin\theta}{sin^3\theta}$ (b) Differentiate $cos\sqrt{x}$ from the first principle. (5+5)

6. (a) Show that $y = \frac{\ell nx}{x}$ has maximum value at $x = e$ (b) Evaluate: $\int x^3 \cos x \, dx$ (5+5)

7. (a) Evaluate: $\int_{\frac{\pi}{6}}^{\frac{\pi}{2}} \frac{cosx\, dx}{sinx\,(2 + sinx)} dx$ (b) Minimize $z = 2x + y$ subject to constraints (5+5)

$x + y \geq 3 \quad 7x + 5y \leq 35$

$x \geq 0 \quad y \geq 0$

8. (a) Find the coordinates of the points of intersection of the line $x + 2y = 6$ with the circle: $x^2 + y^2 - 2x - 2y - 39 = 0$ (5)

(b) If $\underline{a} = 4\underline{i} + 3\underline{j} + \underline{k}$ and $\underline{b} = 2\underline{i} - \underline{j} + 2\underline{k}$. Find a unit vector perpendicular to both $\underline{a}$ and $\underline{b}$. Also find the sine of the angle between them. (5)

9. (a) Find the focus, vertex and directrix of the Parabola $x + 8 - y^2 + 2y = 0$ (5)

(b) Find coordinates of the circumcenter of the triangle whose vertices are $A(-2, 3)$, $B(-4, 1)$ and $C(3, 5)$. (5)

620-12-A

1224 **Warning:- Please write your Roll No. in the space provided and sign. Roll No------------------**

(Inter Part – II) (Session 2020-22 to 2022-24) Sig. of Student ---------------

Mathematics (Objective) (Group 1st) Paper (II)

Time Allowed:- 30 minutes PAPER CODE 4197 Maximum 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 that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question. Write **PAPER CODE, which is printed on this question paper,** on the both sides of the Answer Sheet and fill bubbles accordingly, otherwise the student will be responsible for the situation. Use of Ink Remover or white correcting fluid is not allowed.

Q. 1

1) If $f(x)=e^{\sqrt{x}-1}$, then $f'(0)=$

(A) e (B) $\frac{1}{e}$ (C) $\frac{1}{2}$ (D) ∞

2) $\int e^x(\sin x+\cos x)dx=$

(A) $e^x \sin x+c$ (B) $e^x \cos x+c$ (C) $-e^x \sin x+c$ (D) $-e^x \cos x+c$

3) $\int \frac{dx}{x(\ln 2x)^3}=$

(A) $\ln(\ln 2x)^3+c$ (B) $\frac{(\ln 2x)^4}{4}+c$ (C) $\frac{1}{(\ln 2x)^3}+c$ (D) $-\frac{1}{2(\ln 2x)^2}+c$

4) If $f(x)=x^2$, then range of f is

(A) $[0,\infty[$ (B) $]-\infty, 0]$ (C) $]0,\infty[$ (D) R

5) If $f(x)=x\sec x$, then $f(\pi)=$

(A) π (B) 2π (C) $-\pi$ (D) -2π

6) If $y=e^{-ax}$, then $y\frac{dy}{dx}=$

(A) ae^{-2ax} (B) $-ae$ (C) a^2e^{-ax} (D) $-ae^{-ax}$

7) $f(x)=4-x^2$ decreases in the interval

(A) $]-\infty, 0[$ (B) $]0,\infty[$ (C) $(-2,2)$ (D) $(-\infty,+\infty)$

8) $\frac{1}{1+x^2}$ is the derivative of

(A) $\sin^{-1}x$ (B) $\cos^{-1}x$ (C) $\tan^{-1}x$ (D) $\cot^{-1}x$

P.T.O 1223 – 1224 – 9000 (4)

9) A vector perpendicular to both $2\hat{i}$ and $\hat{k}$ is

(A) $\hat{i}$ (B) $-2\hat{j}$ (C) $\hat{k}$ (D) $2i+k$

10) The angle between the vectors $2\hat{i}+3\hat{j}+\hat{k}$ and $2\hat{i}-\hat{j}-\hat{k}$ is

(A) 30° (B) 45° (C) 60° (D) 90°

11) $\int_0^{\pi/4} \sec^2 x \, dx =$

(A) 0 (B) 1 (C) $\sqrt{2}$ (D) $\frac{1}{\sqrt{2}}$

12) $\int_{-1}^{3} x^3 dx =$

(A) 20 (B) 40 (C) 60 (D) 80

13) The lines represented by $ax^2+2hxy+by^2=0$ are perpendicular if

(A) $a=b$ (B) $a=-b$ (C) $a \neq b$ (D) $a \geq b$

14) The equation of y-axis is

(A) $x=0$ (B) $y=0$ (C) $y=x$ (D) $x+y=0$

15) Slope of the line perpendicular to $3x-4y+5=0$ is

(A) $\frac{-3}{4}$ (B) $\frac{3}{4}$ (C) $\frac{-4}{3}$ (D) $\frac{4}{3}$

16) The graph of the Inequality y < b is a / an

(A) Upper half plane (B) Lower half plane (C) Right half plane (D) Left half plane

17) Angle Inscribed in a semi-circle is

(A) $\frac{\pi}{3}$ (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{2}$ (D) 0

18) Equation of normal to the circle $x^2+y^2=25$ at point (4 , 3) is

(A) $4x+3y=5$ (B) $4x+3y=25$ (C) $4x+3y=0$ (D) $3x-4y=0$

19) If $c=\sqrt{65}$, $b=7$ and $a=4$, then eccentricity of hyperbola is

(A) $\frac{7}{4}$ (B) $\frac{65}{16}$ (C) $\frac{\sqrt{65}}{7}$ (D) $\frac{\sqrt{65}}{4}$

20) If $P(2,3)$ and $Q(6,-2)$ are two points in the plane, then vector $\overrightarrow{PQ}$ is

(A) $4i-5j$ (B) $-4i+5j$ (C) $4i+5j$ (D) $8i+j$

1224 **Warning:- Please, do not write anything on this question paper except your Roll No.**

Mathematics (Subjective) **(Group 1st)** **(Inter Part – II)** **Paper (II)**

Time Allowed: 2.30 hours **(Session 2020-22 to 2022-24)** **Maximum Marks: 80**

Section ---------------- I

2. Answer briefly any Eight parts from the followings:- **8 × 2 = 16**

(i) Define exponential function. **(ii)** Prove the identity $\operatorname{sech}^2 x = 1 - \tanh^2 x$

(iii) For real valued functions f and defined as

$f(x) = 3x^4 - 2x^2$, $g(x) = \dfrac{2}{\sqrt{x}}$, $x \neq 0$ *Find* $fog(x)$ *and* $gof(x)$

(iv) Evaluate the limit by algebraic techniques $\lim\limits_{h\to 0}\dfrac{\sqrt{x+h}-\sqrt{x}}{h}$

(v) Find by definition, the derivative of $x^{\frac{5}{2}}$ with respect to 'x' **(vi)** Differentiate with respect to x of $\dfrac{(x^2+1)^2}{x^2-1}$

(vii) Find $\dfrac{dy}{dx}$ if $x^2 - 4xy - 5y = 0$ **(viii)** Differentiate with respect to 'θ' of $\tan^3\theta\sec^2\theta$

(ix) Find $\dfrac{dy}{dx}$ if $y = x^2 \ln\sqrt{x}$ **(x)** Find y_4 if $y = \sin 3x$

(xi) Prove that $e^{x+h} = e^x\{1 + h + \dfrac{h^2}{2!} + \dfrac{h^3}{3!} + ...\}$

(xii) Find interval in which 'f' is increasing or decreasing if $f(x) = x^2 + 3x + 2$, $x \in (-4 , 1)$

3. Answer briefly any Eight parts from the followings:- **8 × 2 = 16**

(i) Using differentials, find $\dfrac{dx}{dy}$ when $xy - \ln x = c$ **(ii)** Evaluate $\int \dfrac{3-\cos 2x}{1+\cos 2x}\,dx$

(iii) Find the area between the $x-axis$ and the curve $y = \sin 2x$ from $x = 0$ to $x = \dfrac{\pi}{3}$

(iv) Solve the differential equation $\sec x + \tan y\dfrac{dy}{dx} = 0$ **(v)** Evaluate $\int_0^{\pi/6} x\cos x\,dx$

(vi) Evaluate $\int x^2 \ln x\,dx$ **(vii)** Find $\int \dfrac{x^2}{4+x^2}\,dx$

(viii) Find the point three fifth of the way along the line-segment from A(-5 , 8) to B(5 , 3).

(ix) Write down an equation of straight line passing through (5 , 1) and parallel to line passing through points (0 , -1) , (7 , -15)

(x) The xy – coordinate axes are translated through point O' whose coordinates are given in xy – coordinate system. The coordinates of P are given in XY-coordinate system. Find coordinates of P in xy – coordinate system, here P(-5 , -3) , O'(-2 , -6).

(xi) Find area of the triangular region whose vertices are A(5 , 3) , B(-2 , 2) , C(4 , 2).

(xii) Find an equation of each of the lines represented by $10x^2 - 23xy - 5y^2 = 0$

P.T.O **1224 -- 1224 -- 9000**

4. Answer briefly any Nine parts from the followings:- $9 \times 2 = 18$

(i) What is an objective function?

(ii) Graph the solution set of $3x - 2y \geq 6$

(iii) Find centre and radius of circle $x^2 + y^2 + 12x - 10y = 0$

(iv) Write an equation of the circle with centre (-3 , 5) and radius 7.

(v) Find the focus and directrix of parabola $x^2 = 4(y-1)$

(vi) Find the focus and vertex of parabola $y = 6x^2 - 1$

(vii) Find the foci and vertices of ellipse $9x^2 + y^2 = 18$

(viii) Find the eccentricity of hyperbola $25x^2 - 16y^2 = 400$

(ix) Find the direction cosines of vector $\underline{v} = 6\underline{i} - 2\underline{j} + \underline{k}$

(x) Find 'α' so that $|\alpha \underline{i} + (\alpha+1)\underline{j} + 2\underline{k}| = 3$

(xi) Calculate the projection of $\underline{a} = 3\underline{i} + \underline{j} - \underline{k}$ along $\underline{b} = -2\underline{i} - \underline{j} + \underline{k}$

(xii) Prove that $\underline{a} \times (\underline{b} + \underline{c}) + \underline{b} \times (\underline{c} + \underline{a}) + \underline{c} \times (\underline{a} + \underline{b}) = 0$

(xiii) Find the value of α, so that $\alpha\underline{i} + \underline{j}$, $\underline{i} + \underline{j} + 3\underline{k}$ and $2\underline{i} + \underline{j} - 2\underline{k}$ are coplaner.

Section ------------- II

Note: Attempt any three questions. **$(10 \times 3 = 30)$**

5 -(a) Evaluate the limit $\lim\limits_{\theta \to 0} \dfrac{\tan\theta - \sin\theta}{\sin^3\theta}$

(b) If $y = \sqrt{\tan x + \sqrt{\tan x + \sqrt{\tan x + \ldots\ldots\ldots\infty}}}$, Prove that $(2y-1)\dfrac{dy}{dx} = \sec^2 x$

6 -(a) Show that $Y = X^X$ has minimum value at $X = \dfrac{1}{e}$

(b) Evaluate $\displaystyle\int \frac{x}{x^4 + 2x^2 + 5}\,dx$

7 -(a) Evaluate $\displaystyle\int_0^{\pi/4} \cos^4 t\, dt$

(b) Maximize $f(x,y) = 2x + 5y$ subject to the constraints $2y - x \leq 8$; $x - y \leq 4$; $x \geq 0$; $y \geq 0$

8 -(a) Find an equation of a circle of radius 'a' and lying in the second quadrant such that it is tangent to both the axes.

(b) Prove that the line segments joining the mid points of the sides of a quadrilateral taken in order form a parallelogram.

9 -(a) Find centre, foci and directrices of the ellipse $x^2 + 16x + 4y^2 - 16y + 76 = 0$

(b) Find a joint equation of lines through the origin and perpendicular to the lines $x^2 - 2xy\tan\alpha - y^2 = 0$

1224 -- 1224 -- 9000

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(Inter Part – II) (Session 2020-22 to 2022-24) Sig. of Student ----------------

Mathematics (Objective) **(Group 2nd)** **Paper (II)**

Time Allowed:- 30 minutes **PAPER CODE 4196** Maximum 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 that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question. Write **PAPER CODE, which is printed on this question paper,** on the both sides of the Answer Sheet and fill bubbles accordingly, otherwise the student will be responsible for the situation. Use of Ink Remover or white correcting fluid is not allowed.

Q. 1

1) $\int \ln a \cdot a^x\,dx =$

(A) $a^x + c$ (B) $\dfrac{a^x}{\ln a} + c$ (C) $\ln a^x + c$ (D) $2a^x + c$

2) $\int \dfrac{e^x}{e^x - 1}\,dx =$

(A) $\ln|1 - e^x| + c$ (B) $\ln|1 + e^{-x}| + c$ (C) $\ln|e^x - 1| + c$ (D) $\ln|1 - e^{-x}| + c$

3) $\lim\limits_{x\to 0}(1 + 3x)^{\frac{2}{x}} =$

(A) e^2 (B) e^8 (C) e^6 (D) e^4

4) The perimeter P of a square as a function of its area A is

(A) $P = \sqrt{A}$ (B) $P = 4\sqrt{A}$ (C) $P = 4A$ (D) $P = \dfrac{1}{4}\sqrt{A}$

5) If $f(x) = \cot x$ then $f'\left(\dfrac{\pi}{6}\right) =$

(A) -4 (B) [illegible] (C) $\dfrac{1}{4}$ (D) $-\dfrac{1}{4}$

6) $\dfrac{d}{dx}\left[\ln(e^x + e^{-x})\right] =$

(A) $\dfrac{e^x - e^{-x}}{e^x - e^{-x}}$ (B) $\dfrac{e^x - e^{-x}}{e^x + e^{-x}}$ (C) $\dfrac{e^x - e^{-x}}{-e^x + e^{-x}}$ (D) $\dfrac{-e^x + e^{-x}}{e^x + e^{-x}}$

7) If $y = Sin\,h^{-1}(x^3)$ then $\dfrac{dy}{dx} =$

(A) $\dfrac{x^3}{\sqrt{1 + x^6}}$ (B) $\dfrac{-3x^2}{\sqrt{1 + x^6}}$ (C) $\dfrac{1}{\sqrt{1 + x^6}}$ (D) $\dfrac{3x^2}{\sqrt{1 + x^6}}$

8) The derivative of $y = \sec^{-1}\dfrac{x}{a}$ is

(A) $\dfrac{a}{x}(a^2 - x^2)^{\frac{-1}{2}}$ (B) $-x(a^2 - x^2)^{\frac{1}{2}}$ (C) $x(a^2 - x^2)^{\frac{-1}{2}}$ (D) $x(a^2 - x^2)^{3/2}$

P.T.O **1225** – 1224 - 9000 **(3)**

The lines joining the mid points of any two sides of a triangle is always ________ to the third side.

(A) Equal (B) Parallel (C) Perpendicular (D) Base

10) If $\underline{u}$ and $\underline{v}$ be any vectors, then $\underline{u} \times \underline{v}$ is

(A) parallel to $\underline{u}$ and $\underline{v}$ (B) parallel to $\underline{u}$ (C) perpendicular to $\underline{u}$ and $\underline{v}$ (D) orthogonal to $\underline{u}$

11) $\int_a^b f(x)\,dx =$

(A) $\int_b^a f(x)\,dx$ (B) $-\int_b^a f(x)\,dx$ (C) $[f(x)]_a^b$ (D) $f(b)-f(a)$

12) $\int_0^4 x\,dx =$

(A) 0 (B) 6 (C) 8 (D) 16

13) The slope of the line $2x+3y-1=0$ is

(A) $-\frac{2}{3}$ (B) $\frac{2}{3}$ (C) $-\frac{3}{2}$ (D) $\frac{3}{2}$

14) The lines lying in the same plane are called

(A) Collinear (B) Coplanar (C) Concurrent (D) Coincident

15) If the points $(a, 0)$, $(0, b)$ and (x, y) are collinear then

(A) $\frac{x}{a}+\frac{y}{b}=0$ (B) $\frac{a}{x}+\frac{b}{y}=1$ (C) $\frac{x}{a}+\frac{y}{b}=-1$ (D) $\frac{x}{a}+\frac{y}{b}=1$

16) The graph of $x+2y \le 6$ is

(A) Open half plane (B) Closed half plane (C) Full plane (D) No any solution

17) The fixed line of the conic is known as

(A) x-axis (B) y-axis (C) directrix (D) latus rectum

18) The equation $a(x^2+y^2)+2gx+2fy+c=0$ represents a circle with centre

(A) $(-ag, -af)$ (B) $\left(-\frac{g}{a}, -\frac{f}{a}\right)$ (C) $\left(\frac{g}{a}, \frac{f}{a}\right)$ (D) (ag, af)

19) Equation of latus rectum of the parabola $x^2=-4ay$ is

(A) $x=a$ (B) $x=-a$ (C) $y=a$ (D) $y=-a$

20) $(\underline{a}-\underline{b})\cdot(\underline{a}+\underline{b})=$

(A) $|\underline{a}|^2-|\underline{b}|^2$ (B) $|\underline{a}|^2+|\underline{b}|^2$ (C) $2(\underline{a}+\underline{b})$ (D) 0

1224 Warning:- Please, do not write anything on this question paper except your Roll No.

Mathematics (Subjective) **(Group 2nd)** (Inter Part – II) Paper (II)

Time Allowed: 2.30 hours (Session 2020-22 to 2022-24) Maximum Marks: 80

Section ---------------- I

2. Answer briefly any Eight parts from the followings:- **8 × 2 = 16**

(i) Evaluate $\lim_{x\to -1}\left(\frac{x^3+x^2}{x^2-1}\right)$ (ii) Define inverse of a function f.

(iii) Show that $x = a\sec\theta$, $y = b\tan\theta$ represent the equation of hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$

(iv) Evaluate $\lim_{n\to\infty}\left(1-\frac{1}{n}\right)^n$ (v) Find $f'(x)$, if $y = x^2\ln\sqrt{x}$

(vi) Show that $\cos(x+h) = \cos x - h\sin x - \frac{h^2}{\underline{|2}}\cos x + \frac{h^3}{\underline{|3}}\sin x + \ldots\ldots$

(vii) Determine the interval in which f is decreasing, here $f(x) = \cos x$, $x \in \left(\frac{-\pi}{2}, \frac{\pi}{2}\right)$

(viii) If $x = y\sin y$, Find $\frac{dy}{dx}$ (ix) Differentiate $\sin^3 x$ $w.r.t$ $\cos^2 x$

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

(xi) Write the Quotient rule for derivative of two functions. (xii) Find $\frac{dy}{dx}$, if $x = at^2$, $y = 2at$

3. Answer briefly any Eight parts from the followings:- **8 × 2 = 16**

(i) Find dy and δy of $y = \sqrt{x}$ x changes from 4 to 4.41

(ii) Evaluate $\int\frac{3-\cos 2x}{1+\cos 2x}\,dx$, $\cos 2x \neq -1$ (iii) Evaluate $\int\frac{1}{x\ell nx}\,dx$

(iv) Evaluate $\int(\ell nx)^2\,dx$ (v) Evaluate $\int\frac{3x+1}{x^2-x+6}\,dx$ (vi) Evaluate $\int_0^{\frac{\pi}{3}}\cos^2 x\sin x\,dx$

(vii) Find the area between x-axis and curve $y = \sin 2x$ from $x = 0$ to $x = \frac{\pi}{3}$

(viii) Find 'h' such that A(-1 , h) , B(3 , 2) and C(7 , 3) are collinear

(ix) Find 'k' so that the lines joining A(7 , 3) , B(k , -6) and line joining C(-4 , 5) , D(-6 , 4) are perpendicular.

(x) Find point of intersection of lines $3x + y + 12 = 0$, $x + 2y - 1 = 0$

(xi) Find equation of lines represented by $20x^2 + 17xy - 24y^2 = 0$

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

P.T.O **1226** -- 1224 -- 9000

4. Answer briefly any Nine parts from the followings:- $9 \times 2 = 18$

(i) Graph the solution set of the linear inequality $3x+7y \geq 21$ in $xy-$plane.

(ii) Define feasible region and feasible solution.

(iii) Find an equation of the circle with ends of diameter at (-3 , 2) and (5 , -6)

(iv) Find centre and radius of the circle $4x^2+4y^2-8x+12y-25=0$

(v) Find equation of Normal to the circle $x^2+y^2=25$ at $(5\cos\theta\ ,\ 5\sin\theta)$

(vi) Write equation of parabola with directrix $x=-2$ and focus (2 , 2).

(vii) Find foci and vertices of the ellipse $x^2+4y^2=16$

(viii) Find equation of Hyperbola with foci $(\pm 5,0)$ and vertex $(3,0)$

(ix) Find sum of the vectors $\overrightarrow{AB}$ and $\overrightarrow{CD}$ given A(1 , -1) , B(2 , 0) , C(-1 , 3) and D(-2 , 2).

(x) let $\underline{u}=\underline{i}+2\underline{j}-\underline{k}$, $\underline{v}=3\underline{i}-2\underline{j}+2\underline{k}$, $\underline{w}=5\underline{i}-\underline{j}+3\underline{k}$. Find $|3\underline{v}+\underline{w}|$.

(xi) Find $\underline{v}$ for which $\underline{v}\cdot\underline{i}=0$, $\underline{v}\cdot\underline{j}=0$, $\underline{v}\cdot\underline{k}=0$.

(xii) Prove that $\underline{a}\times(\underline{b}+\underline{c})+\underline{b}\times(\underline{c}+\underline{a})+\underline{c}\times(\underline{a}+\underline{b})=0$.

(xiii) Find α so that $\alpha\underline{i}+\underline{j}$, $\underline{i}+\underline{j}+3\underline{k}$ *and* $2\underline{i}+\underline{j}-2\underline{k}$ are coplaner.

Section ------------- II

Note: Attempt any three questions. **(10 × 3 = 30)**

5 -(a) If $f(x)=\begin{cases} 3x & if \quad x \leq -2 \\ x^2-1 & if \quad -2<x<2 \\ 3 & if \quad x \geq 2 \end{cases}$

Discuss continuity at $x=2$

(b) Differentiate $\dfrac{(\sqrt{x}+1)(x^{3/2}-1)}{x^{3/2}-x^{1/2}}$ w.r.t. x

6 -(a) Show that $\int \dfrac{1}{\sqrt{a^2+x^2}}\,dx = \ln(x+\sqrt{a^2+x^2})+c$ here $a>0$.

(b) If $x=\sin\theta$, $y=\sin m\theta$, show that $(1-x^2)y_2-xy_1+m^2y=0$

7 -(a) Evaluate the definite integral $\int_{\pi/6}^{\pi/2} \dfrac{\cos x}{\sin x\,(2+\sin x)}\,dx$

(b) Minimize $z=2x+y$ subject to the constraints $x+y \geq 3$; $7x+5y \leq 35$ $x \geq 0$; $y \geq 0$

8 -(a) Find the equation of the tangent drawn from $(-7,-2)$ to $(x+1)^2+(y-2)^2=26$

(b) Using vectors, prove that $\sin(\alpha-\beta)=\sin\alpha\cos\beta-\cos\alpha\sin\beta$

9 -(a) Find area of region bounded by the triangle whose sides are

$7x-y-10=0$, $10x+y-41=0$, $3x+2y+3=0$

(b) Find the centre , foci eccentricity, vertices of ellipse whose equation is

$x^2+16x+4y^2-16y+76=0$

Sahiwal Board-2024

★ **Mathematics** **HSSC (12th) 1st Annual 2024** Roll No ____________ (To be filled by the candidate)

Paper : II Objective (i) | Paper Code | 8 | 1 | 9 | 1 | Marks : 20 Time : 30 Minutes

Note:- You have four choices for each objective type question as A, B, C and D. The choice which you think is correct; fill that circle in front of that question number in your answer book. Use marker or pen to fill the circles. Cutting or filling up two or more circles will result no mark.

SECTION–A

Q.1	Questions	A	B	C	D
1.	$\lim\limits_{x\to a}\frac{f(x)-f(a)}{x-a}=$	$f'(x)$	$f'(0)$	$f'(x-a)$	$f'(a)$
2.	The range of $f(x)=2+\sqrt{x+1}$ is:	$[-1,\infty[$	$[0,\infty[$	$[2,\infty[$	$[-2,\infty[$
3.	If $f(x)=\tan x$ then $f'\left(\frac{\pi}{3}\right)=$	4	2	1	0
4.	If $f(x)=x^3+2x+9$ then $f'''(0)$ is:	0	2	3	6
5.	Maclaurin series for $\frac{1}{1+x}$ is:	$1-x+x^2-x^3+...$	$1-x-x^2-x^3-x^4...$	$1+x+x^2+x^3+...$	$-1-x-x^2-x^3-$
6.	A function $f(x)$ is increasing in the interval (a,b) if $f(x_2)>f(x_1)$ whenever:	$x_2>x_1$	$x_2<x_1$	$x_2=x_1$	$x_1=0,\ x_2=$
7.	$\int\frac{\sin 2x}{\sin x}dx=$	$\sin 2x+c$	$2\sin 2x+c$	$\frac{1}{2}\sin x+c$	$2\sin x+c$
8.	Solution of differential equation $\frac{dy}{dx}=-y$ is:	$y=c\ e^{-x}$	$y=ce^{x}$	$y=e^{cx}$	$y=x\ e^{-x}$
9.	$\int\frac{e^x}{e^x-2}dx=$	$ln(e^x+2)+c$	$ln(e^x+3)+c$	$ln(e^x-2)+c$	$ln(e^x-3)+$
10.	If $\int f(x)\,dx=\frac{1}{a}\sec^{-1}\frac{x}{a}+c$ then $f(x)=$	$\frac{1}{\sqrt{x^2-a^2}}$	$\frac{1}{x\sqrt{x^2-a^2}}$	$\frac{1}{x\sqrt{x^2+a^2}}$	$\frac{1}{x\sqrt{a^2-x^2}}$

	Questions	A	B	C	D
11.	Equation of a line passing through $(-2,5)$ having slope 0 is:	$y=-5$	$y=5$	$x=-2$	$x=2$
12.	If the distance of the point $(5,x)$ from $x-axis$ is 3 then $x=$	7	5	3	-5
13.	The slope of the line with inclination $60°$ is:	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$
14.	$(3,2)$ is not in the solution of inequality:	$x+y>2$	$x-y>1$	$3x+5y>7$	$3x-7y<3$
15.	The vertex of the parabola $(x-1)^2=8(y+2)$ is:	$(1,-2)$	$(0,1)$	$(2,0)$	$(0,0)$
16.	The end points of the major axis of the ellipse are called its:	Foci	Vertices	Covertices	Directrix
17.	Directrix of parabola $x^2=16y$ is:	$x+4=0$	$x-4=0$	$y-4=0$	$y+4=0$
18.	For any two vectors $\underline{a}$ and $\underline{b}$ projection of $\underline{a}$ on $\underline{b}$ is:	$\frac{\underline{a}.\underline{b}}{\lvert\underline{a}\rvert}$	$\frac{\underline{a}.\underline{b}}{\lvert\underline{b}\rvert}$	$\frac{\underline{a}.\underline{b}}{\lvert\underline{a}\rvert\lvert\underline{b}\rvert}$	$\underline{a}.\underline{b}$
19.	The unit vector of $2\underline{i}+\underline{j}$ is:	$2\underline{i}-\underline{j}$	$\frac{2\underline{i}+\underline{j}}{5}$	$\frac{2\underline{i}+\underline{j}}{3}$	$\frac{2\underline{i}+\underline{j}}{\sqrt{5}}$
20.	If $\frac{\underline{U}.\underline{V}}{\lvert\underline{U}\rvert\lvert\underline{V}\rvert}=\frac{1}{2}$, then the angle between $\underline{U}$ and $\underline{V}$ is:	$30°$	$60°$	$300°$	$90°$

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SECTION – B

Note: - Section B is compulsory.

2. Write short answers to any EIGHT parts. (8 x 2 = 16)

i. Express the volume V of a cube as a function of area A of its base.

ii. Prove the identity $\operatorname{sech}^2 x = 1 - \tanh^2 x$.

iii. Determine whether $f(x) = x^{\frac{2}{3}} + 6$ is even or odd.

iv. Evaluate $\lim_{x\to 0} \frac{\sin x^0}{x}$.

v. Differentiate $\frac{2x-1}{\sqrt{x^2+1}}$ w.r.t 'x'.

vi. Find $\frac{dy}{dx}$ if $y^2 + x^2 - 4x = 5$.

vii. Find $\frac{dy}{dx}$ by making suitable substitution if $y = (3x^2 - 2x + 7)^6$.

viii. Differentiate $\sin x$ w.r.t $\cot x$.

ix. Find $\frac{dy}{dx}$ if $y = ln\left(x + \sqrt{x^2+1}\right)$.

x. Find y_2 if $y = \sqrt{x} + \frac{1}{\sqrt{x}}$.

xi. Find the extreme value of $f(x) = x^2 - x - 2$.

xii. Divide 20 into two parts so that the sum of their squares will be minimum.

3. Write short answers to any EIGHT parts. (8 x 2 = 16)

i. Using differential find $\frac{dx}{dy}$ if $xy - ln x = c$.

ii. Evaluate $\int (2x-3)^{\frac{1}{2}} dx$

iii. Evaluate $\int \frac{e^x}{e^x+3} dx$.

iv. Find $\int x \cos x \, dx$.

v. Evaluate $\int_2^{\sqrt{5}} x\sqrt{x^2-1}\; dx$.

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 $ydx + xdy = 0$.

viii. Find the distance between the points A(−8,3) ; B(2,−1). Find the mid-point of the line-segment joining the given points also.

ix. Find the point three-fifth of the way along the line-segment from A(−5,8) to B(5,3).

x. Find the slope and inclination of the line joining the points (−2,4) ; (5,11).

xi. Determine the value of p such that the lines $2x - 3y - 1 = 0$, $3x - y - 5 = 0$ and $3x + py + 8 = 0$ meet at a point.

xii. Find an equation of each of the lines represented by $20x^2 + 17xy - 24y^2 = 0$.

4. Write short answers to any NINE parts. (9 x 2 = 18)

i. Graph the solution set of inequality $5x - 4y \le 20$.

ii. Define a linear inequality.

iii. Show that the equation $2x^2 - xy + 5x - 2y + 2 = 0$ represents a pair of lines.

iv. If centre is (0,0), focus is (6,0) and vertex is (4,0), find the equation of hyperbola.

v. Find the length of latus rectum of the ellipse $9x^2 + y^2 = 18$.

vi. Find the focus and vertex of parabola $y^2 = 8x$.

vii. Find the equation of tangent to the circle $x^2 + y^2 = 25$ at the point (4,3).

viii. Find the centre and radius of the circle $x^2 + y^2 + 12x - 10y = 0$.

ix. If $\vec{u} = 2i - 7j$, $\vec{v} = i - 6j$ and $\vec{w} = -i + j$, find $2\vec{u} - 3\vec{v} + 4\vec{w}$.

x. Find a vector of length 5 in the direction opposite to $\vec{v} = \hat{i} - 2\hat{j} + 3\hat{k}$.

xi. Find the projection of $\vec{a}$ along $\vec{b}$ and $\vec{b}$ along $\vec{a}$ when $\vec{a} = 3i + j - k$ and $\vec{b} = -2i - j + k$.

xii. Prove that $\vec{a} \times (\vec{b} + \vec{c}) + \vec{b} \times (\vec{c} + \vec{a}) + \vec{c} \times (\vec{a} + \vec{b}) = \vec{0}$.

xiii. A force $\vec{F} = 4\hat{i} - 3\hat{k}$ passes through the point $A(2,-2,5)$. Find the moment of $\vec{F}$ about the point $B(1,-3,1)$.

SECTION-C

Note: Attempt any THREE questions. Each question carries (5+5=10) marks.

5. (a) Prove that $\lim_{x\to 0} \frac{a^x - 1}{x} = \log_e^a$.

(b) Differentiate with respect to 'x' $\frac{\sqrt{1+x} - \sqrt{1-x}}{\sqrt{1+x} + \sqrt{1-x}}$.

6. (a) If $y = (\cos^{-1} x)^2$, prove that $(1-x^2)y_2 - xy_1 - 2 = 0$.

(b) Evaluate the indefinite integral $\int \sqrt{a^2 + x^2}\; dx$.

7. (a) Solve the differential equation $\left(y - x\frac{dy}{dx}\right) = 2\left(y^2 + \frac{dy}{dx}\right)$.

(b) Maximize $f(x,y) = 2x + 5y$ subject to the constraints $2y - x \le 8$, ; $x - y \le 4$, $x \ge 0$, ; $y \ge 0$.

8. (a) Find the equation of the tangent to the circle $x^2 + y^2 = 2$ parallel to the line $x - 2y + 1 = 0$.

(b) Show that mid-point of hypotenuse a right triangle is equidistant from its vertices (use vectors).

9. (a) Prove that the latus rectum of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is $\frac{2b^2}{a}$.

(b) The points (4,−2), (−2,4) and (5,5) are vertices of a triangle. Find in-centre of the triangle.