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	$\int\ell n x\,dx=?$	$x\ell nx+c$	$x\ell nx-x+c$	$x\ell nx+x+c$	$\ell nx+x+c$

1209-XII124

Intermediate Part Second

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

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	$\int\sqrt{1-\cos2x}\,dx=$:	$-\sqrt{2}\cos x+c$	$\sqrt{2}\sin x+c$	$\sqrt{2}\cos x+c$	$-\sqrt{2}\sin x+c$
4	$\int e^x\left(\frac{1}{x}+\ln x\right)dx=$:	$\frac{1}{x}e^x+c$	$e^x(\ln x)+c$	$\frac{e^x}{\ln x}+c$	$\frac{\ln x}{e^x}+c$
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	$\frac{d}{dx}(3^x)=$:	$3^x\ln3$	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	$\lim_{x\to0}(1+3x)^{\frac{2}{x}}=$:	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:	$x-y>4$	$x-y\geq4$	$x+y<4$	$x+y>5$
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

.210-XII124 Roll No. ________

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 $g(x)=\frac{3}{x-1}$, $x\ne 1$; 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 $\cos x=1-\frac{x^2}{\lfloor 2}+\frac{x^4}{\lfloor 4}-\frac{x^6}{\lfloor 6}+\ldots\ldots$

(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 $\int_{\frac{\pi}{6}}^{\frac{\pi}{2}}\frac{\cos x}{\sin x(2+\sin x)}dx$ 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. : ________

Objective Paper Code **8191**

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	$\lim_{x\to 0} \frac{x}{\sin 2x} = ?$	$\frac{1}{2}$	2	$-\frac{1}{2}$	-2
2	The function $f(x)=\frac{x}{x^2-4}$ is discontinuous at:	0	± 2	1	± 1
3	$\lim_{h\to 0} \frac{f(a+h)-f(a)}{h} = ?$	$f(a)$	$f'(a+h)$	$f'(a)$	$f'(x)$
4	$\frac{dy}{dx} = -\frac{1}{x^2}$ if :	$y=-\frac{1}{x}$	$y=-x$	$y=\ell nx$	$y=\frac{1}{x}$
5	If $f(x)=\cos x$, then $f'\left(\frac{\pi}{2}\right)=?$	-1	1	0	2
6	$\frac{d}{dx}(e^{\frac{1}{x}})=?$	$e^{\frac{1}{x}}$	$-\frac{1}{x^2}e^{\frac{1}{x}}$	$\frac{1}{x}e^{\frac{1}{x}}$	$\frac{1}{x^2}e^{\frac{1}{x^2}}$
7	Differential of $\sqrt{y}$ is:	$\sqrt{y}\,dx$	$\sqrt{y}\,dy$	$\frac{1}{2\sqrt{y}}dy$	$\frac{1}{2\sqrt{y}}dx$
8	$\int \sec ax \tan ax\, dx = ?$ is :	$\frac{\tan ax}{a}+c$	$\frac{\sec ax}{a}+c$	$\frac{\sec ax \tan ax}{a}+c$	$\frac{\cot ax}{a}+c$
9	$\int \frac{1}{x^2+3}dx = ?$	$\tan^{-1}\left(\frac{x}{3}\right)+c$	$\frac{1}{3}\tan^{-1}\left(\frac{x}{3}\right)+c$	$\frac{1}{\sqrt{3}}\tan^{-1}\left(\frac{x}{\sqrt{3}}\right)+c$	$\cot^{-1}(3x)+c$
10	$\int_{\frac{-\pi}{2}}^{\frac{\pi}{2}} \cos\left(\frac{x}{2}\right)dx = ?$	1	$\sqrt{2}$	$2\sqrt{2}$	$4\sqrt{2}$
11	Slope of a line $ax+by+c=0$ is:	$-\frac{a}{b}$	$\frac{a}{b}$	$-\frac{b}{a}$	$\frac{b}{a}$
12	Inclination of a line $x=6$ is:	0	π	$\frac{\pi}{4}$	$\frac{\pi}{2}$
13	The point of intersection of lines $y=2$ and $x=-1$ is:	(2, –1)	(2, 1)	(2, 0)	(–1, 2)
14	$x-y<2$ is satisfied by the point:	(3, 1)	(–1, 1)	(1, –1)	(0, –2)
15	Center of a circle $(x+1)^2+y^2=25$ is:	(0, 0)	(1, 0)	(–1, 0)	(0, 2)
16	Major axis of $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ is :	$x=a$	$x=\pm\frac{a}{c}$	$y=\pm\frac{a}{b}$	$y=0$
17	Length of minor axis of $x^2+4y^2=16$ is:	4	16	20	36
18	Center of $\frac{(x-1)^2}{4}-\frac{(y+1)^2}{16}=1$ is:	(0, 0)	(1, –1)	(–1, –1)	(–1, 1)
19	The direction cosines of y-axis are :	0, 0, 0	1, 0, 0	0, 1, 0	0, 0, 1
20	$\hat{i}\cdot\hat{k}\times\hat{j}=?$	0	1	$\frac{1}{2}$	–1

1207-XII123-15000

Intermediate Part Second

Roll No. ________

MATHEMATICS (Subjective) Group – I

Time: 02:30 Hours Marks: 80

SECTION – I

2. Attempt any EIGHT parts: 16

(i) Define constant function with example.

(ii) Find $f^{-1}(x)$ if $f(x) = -2x + 8$

(iii) Evaluate $\lim\limits_{x \to 1} \dfrac{x^3 - 3x^2 + 3x - 1}{x^3 - x}$

(iv) Find derivative by definition $\dfrac{1}{x^{40}}$

(v) Differentiate w.r.t. x, $\dfrac{\sqrt{1+x}}{\sqrt{1-x}}$

(vi) Find $\dfrac{dy}{dx}$, $xy + y^2 = 2$

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

(viii) Differentiate $\cos^{-1}\left(\dfrac{x}{a}\right)$

(ix) Find $\dfrac{dy}{dx}$ if $y = x\, e^{\sin x}$

(x) Determine the interval in which $f(x) = \cos x$ is increasing or decreasing for the domain $x \in \left(-\dfrac{\pi}{2}, \dfrac{\pi}{2}\right)$.

(xi) Define problem constraint.

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

3. Attempt any EIGHT parts: 16

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

(ii) Solve the differential equation $(e^x + e^{-x})\dfrac{dy}{dx} = e^x - e^{-x}$

(iii) Evaluate $\int_{-1}^{2} (x + |x|)\, dx$

(iv) Evaluate $\int \dfrac{e^{m\tan^{-1}x}}{1+x^2}\, dx$

(v) Evaluate $\int \dfrac{1}{x\ell nx}\, dx$

(vi) Evaluate $\int \dfrac{(1-\sqrt{x})^2}{\sqrt{x}}\, dx$

(vii) Use differential find $\dfrac{dy}{dx}$ if $x^2 + 2y^2 = 16$.

(viii) Find the value of $2\underline{i} \times 2\underline{j} \cdot \underline{k}$

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

(x) If $\overrightarrow{AB} = \overrightarrow{CD}$, then find the coordinate of the point A when points, B, C, D are (1 , 2), (–2 , 5), (4 , 11) respectively.

(xi) Find the volume of parallelpiped if $\underline{u} = 3\underline{i} + 2\underline{k}$, $\underline{v} = \underline{i} + 2\underline{j} + \underline{k}$, $\underline{w} = -\underline{j} + 4\underline{k}$

(xii) Find a vector of length 5, in the direction opposite that of $\underline{v} = \underline{i} - 2\underline{j} + 3\underline{k}$

4. Attempt any NINE parts: 18

(i) Find the midpoint of the line segment joining the points A(3 , 1) ; B(–2 , –4). Also find the distance between them.

(ii) Find slope and inclination of the line joining the points (3 , –2) ; (2 , 7).

(iii) Find an equation of horizontal line through (7 , –9).

(iv) Find an equation of the line bisecting second and fourth quadrant.

(v) Check whether the lines $3x + 4y - 7 = 0$, $2x - 5y + 8 = 0$, $x + y - 3 = 0$ are concurrent or not ?

(Continued P/2)

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

(vii) Find the measure of the angle between the lines represented by $3x^2 + 7xy + 2y^2 = 0$

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

(ix) Show that the line $3x - 2y = 0$ is tangent to the circle $x^2 + y^2 + 6x - 4y = 0$

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

(xi) Find focus and directrix of the parabola $y^2 = 8x$

(xii) Find an equation of ellipse with given data. Vertices (–1 , 1), (5 , 1) ; foci (4 , 1) and (0 , 1)

(xiii) Find equation of hyperbola with given data. foci $(0, \pm 6)$, $e = 2$

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

5. (a) Evaluate: $\lim\limits_{x \to 0} \dfrac{\sec x - \cos x}{x}$ 05

(b) If $y = \sqrt{x} - \dfrac{1}{\sqrt{x}}$, then show that $2x\dfrac{dy}{dx} + y = 2\sqrt{x}$ 05

6. (a) Evaluate: $\int e^{2x} \cos 3x \, dx$ 05

(b) Find equation of line through intersection of lines $x - y - 4 = 0$, $7x + y + 20 = 0$ and parallel to line $6x + y - 14 = 0$ 05

7. (a) Evaluate: $\displaystyle\int_{\frac{1}{2}}^{\frac{\sqrt{3}}{2}} \frac{\sin^{-1} x}{\sqrt{1-x^2}} dx$ 05

(b) Maximize $f(x , y) = 2x + 5y$ subject to the constraints: $2y - x \le 8$; $x - y \le 4$; $x \ge 0$; $y \ge 0$ 05

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

(b) Find an equation of the circle which passes through the points A(5 , 10), B(6 , 9) and C(– 2 , 3) 05

9. (a) Find an equation of the ellipse with given data center (2 , 2), major axis parallel to y-axis and of length 8 units, minor axis parallel to x-axis and of length 6 units. 05

(b) Prove that by vector method. $\sin(\alpha - \beta) = \sin\alpha \cdot \cos\beta - \cos\alpha \sin\beta$ 05

1207-XII123-15000

160
Objective
Paper Code
8198

Roll No. : ________

Intermediate Part Second - 136

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.acf**

S.#	Questions	A	B	C	D
1	(0 , 0) is one of the solutions of inequality:	$3x+4y>4$	$2x-3y>4$	$x+3y>5$	$x-3y>-4$
2	If a straight line is parallel to x-axis then its slope is:	1	-1	0	∞
3	Intercepts form of equation of line is:	$y=mx+c$	$\frac{x}{a}+\frac{y}{b}=1$	$y-y_1=m(x-x_1)$	$x\cos\alpha+y\sin\alpha=p$
4	A linear equation in two variable represents:	Circle	Ellipse	Hyperbola	Straight line
5	Center of the circle $(x-1)^2+(y+3)^2=3$ is:	$(1,-3)$	$(-1,3)$	$(-1,-3)$	$(1,3)$
6	Parabola $x^2=-8y$ opens:	Rightwards	Leftwards	Upwards	Downwards
7	Length of major axis of an ellipse $\frac{(x-1)^2}{2^2}+\frac{(y+1)^2}{3^2}=1$ is:	18	8	6	4
8	Which conics is represented by the equation $x^2-y^2=4$?	Circle	Parabola	Ellipse	Hyperbola
9	Which vector is equal to vector $\underline{i}\cdot\underline{j}\times\underline{k}$?	0	1	-1	$\underline{i}$
10	The angle between the vectors $2\underline{i}+3\underline{j}+\underline{k}$ and $2\underline{i}-\underline{j}-\underline{k}$ is:	30°	45°	60°	90°
11	If $f(x)=x^2+\cos x$, then $f(x)$ is:	Constant function	Linear function	Odd function	Even function
12	The range of the function $y=2+\sqrt{x-1}$ is:	$[2,\infty)$	$[3,\infty)$	$[1,\infty)$	$[-1,\infty)$
13	$\frac{d}{dx}(\log_a^x)=$:	$\frac{1}{x}$	$\frac{1}{x}\ell na$	$\frac{1}{x\ell na}$	$\frac{1}{a\ell nx}$
14	$\frac{d}{dx}=(e^x+e^{-x})=$:	$2\sinh x$	$2\cosh x$	$\sinh x$	$\cosh x$
15	If $f(x)=3x^2-2x+1$, then $f'(0)=$:	5	-2	1	2
16	$\frac{1}{\sqrt{1+x^2}}$ is the derivative of:	$\sinh^{-1}x$	$\cosh^{-1}x$	$\tanh^{-1}x$	$\tan^{-1}x$
17	$\int\tan x\,dx=$:	$\ell n\|\cos x\|+c$	$\ell n\|\operatorname{cosec}x\|+c$	$\ell n\|\sec x\|+c$	$\ell n\|\cot x\|+c$
18	$\int_0^1\frac{1}{1+x^2}dx=$:	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{\pi}{6}$
19	$\int(\sin^2x+\cos^2x)\,dx=$:	$\sin x+\cos x+c$	$\sin 2x+\cos 2x+c$	$\frac{x^2}{2}+c$	$x+c$
20	Suitable substitution for $\int\sqrt{a^2-x^2}\,dx$ is:	$x=a\sec\theta$	$x=a\sin\theta$	$x=a\tan\theta$	$x=a\cot\theta$

1208-XII112336-18000

1208-XII123 Intermediate Part Second Roll No. ________

MATHEMATICS (Subjective) Group – II

Time: 02:30 Hours Marks: 80

SECTION – I

2. Attempt any EIGHT parts: 16

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

(ii) Express the limit $\lim_{x \to 0} (1+3x)^{\frac{2}{x}}$ in terms of e.

(iii) Evaluate $\lim_{x \to -2} \frac{2x^3 + 5x}{3x - 2}$

(iv) Differentiate $\frac{1}{x-a}$ by definition

(v) If $y = \left(\sqrt{x} - \frac{1}{\sqrt{x}}\right)^2$ then find $\frac{dy}{dx}$

(vi) If $y = (3x^2 - 2x + 7)^6$, then find $\frac{dy}{dx}$ by making a suitable substitution.

(vii) If $y = e^x(1 + \ell nx)$ then find $\frac{dy}{dx}$

(viii) If $y = x^2 e^{-x}$ then find y_1 , y_2

(ix) Define increasing and decreasing function.

(x) If $x = at^2$, $y = 2at$ then find $\frac{dy}{dx}$

(xi) Graph the solution region of $4x - 3y \le 12$, $x \ge \frac{-3}{2}$

(xii) Define optimal solution.

3. Attempt any EIGHT parts: 16

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

(ii) Evaluate the indefinite integral $\int (\sqrt{x} + 1)^2 \, dx$

(iii) Evaluate $\int \tan^2 x \, dx$

(iv) Evaluate $\int a^{x^2} x \, dx$, $a > 0$, $a \ne 1$

(v) Evaluate $\int \frac{-2x}{\sqrt{4 - x^2}} dx$

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

(vii) Find integral by parts $\int x \sin x \, dx$

(viii) Find a unit vector in direction of $\underline{v} = [3, -4]$

(ix) Write a unit vector whose magnitude is 2 and direction is same as of $\underline{v} = -\hat{i} + \hat{j} + \hat{k}$

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

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

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

4. Attempt any NINE parts: 18

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

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

(iii) The coordinates of point P are (– 6, 9). The axes are translated through the point O′(–3, 2). Find the coordinates of point P referred to new axes.

(iv) Find equation of a straight line if its slope is 2 and y-intercepts is 5.

(v) Find the equation of the line through the points (–2, 1) and (6, –4).

(Continued P/2)

(vi) Find the point of intersection of lines $x + 4y - 12 = 0$ and $x - 3y + 3 = 0$

(vii) Find the lines represented by $3x^2 + 7xy + 2y^2 = 0$

(viii) Find the center and radius of the circle $5x^2 + 5y^2 + 24x + 36y + 10 = 0$

(ix) Find the equation of normal to the circle $x^2 + y^2 = 25$ at (4, 3)

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

(xi) Find the focus and vertex of a parabola $x^2 = 5y$

(xii) Find the equation of ellipse with foci (± 3 , 0) and minor axis of length 10

(xiii) Find foci and vertices of $x^2 - y^2 = 9$

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

5. (a) Evaluate: $\lim\limits_{\theta \to 0} \dfrac{1-\cos p\theta}{1-\cos q\theta}$ 05

(b) Differentiate w.r.t. x, $\dfrac{\sqrt{1+x}-\sqrt{1-x}}{\sqrt{1+x}+\sqrt{1-x}}$ 05

6. (a) Evaluate: $\int \dfrac{dx}{\sqrt{7-6x-x^2}}$ 05

(b) Find equation of two parallel lines perpendicular to $2x - y + 3 = 0$ such that the product of the x- and y-intercepts of each is 3 05

7. (a) Evaluate $\int_0^{\frac{\pi}{4}} \cos^4 t \, dt$ 05

(b) Maximize $f(x , y) = x + 3y$ subject to the constraints: $2x + 5y \le 30$; $5x + 4y \le 20$; $x \ge 0$; $y \ge 0$ 05

8. (a) If $x = \sin\theta$, $y = \sin m\theta$ show that $(1-x^2)y_2 - xy_1 + m^2y = 0$ 05

(b) Find an equation of the circle passing through the points A(1, 2) and B(1, –2) and touching to the line $x + 2y + 5 = 0$ 05

9. (a) Find center, foci, eccentricity and vertices of ellipse $x^2 + 16x + 4y^2 - 16y + 76 = 0$ 05

(b) Prove that $\sin(\alpha - \beta) = \sin\alpha\cos\beta - \cos\alpha\sin\beta$ 05

1208-XII123-18000

Faisalabad Board-2022

Objective
Paper Code
8197

Roll No. : __________

Intermediate Part Second - 252

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.beb**

S.#	Questions	A	B	C	D
1	If α is the inclination of the line ℓ, then its slope is:	$\sin\alpha$	$\cos\alpha$	$\tan\alpha$	$\cot\alpha$
2	The lines represented by $ax^2+2hxy+by^2=0$ are imaginary if:	$h^2-ab=0$	$h^2-ab<0$	$h^2-ab>0$	$h^2-ab\neq 0$
3	Two lines $a_1x+b_1y+c_1=0$ and $a_2x+b_2y+c_2=0$ are parallel if:	$a_1a_2+b_1b_2=0$	$a_1a_2-b_1b_2=0$	$a_1b_2-a_2b_1=0$	$a_1b_2+a_2b_1=0$
4	Equation of vertical line through $(7,-9)$ is:	$x=7$	$x=-9$	$y=7$	$y=-9$
5	$(1,0)$ is the solution of the inequality:	$7x+2y<8$	$3x+y>6$	$x-3y<0$	$-3x+y>0$
6	Length of tangent drawn from $(0,1)$ to the circle $x^2+y^2+6x-3y+3=0$, is:	4	3	2	1
7	Vertex of the parabola $(y-3)^2=8(x+2)$ is:	$(0,0)$	$(3,-2)$	$(-3,2)$	$(-2,3)$
8	For hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$:	$b^2=a^2-c^2$	$b^2=c^2-a^2$	$b^2=a^2+c^2$	$a^2+b^2+c^2=0$
9	If $\bar{F}=4\underline{i}+3\underline{j}+5\underline{k}$ and $\bar{d}=-\underline{i}+3\underline{j}+8\underline{k}$, then work done is:	30 units	45 units	53 units	47 units
10	If $\underline{U}$, $\underline{V}$ and $\underline{W}$ are coterminous edges of a tetrahedron, then its volume is:	$[\underline{U}\ \underline{V}\ \underline{W}]$	$\frac{1}{3}[\underline{U}\ \underline{V}\ \underline{W}]$	$\frac{1}{6}[\underline{U}\ \underline{V}\ \underline{W}]$	$\frac{1}{9}[\underline{U}\ \underline{V}\ \underline{W}]$
11	$x=a\cos\theta$, $y=b\sin\theta$ are parametric equations of:	Circle	Parabola	Ellipse	Hyperbola
12	Domain of $f(x)=\sqrt{x+1}$ is:	$[-1,+\infty)$	$(-\infty,+\infty)$	$(0,+\infty)$	$[0,+\infty)$
13	If $y=\tanh^{-1}x$, then $\frac{dy}{dx}=$:	$\frac{1}{1+x^2}$	$\frac{1}{1-x^2}$	$\frac{-1}{1+x^2}$	$\frac{-1}{1-x^2}$
14	$\frac{d}{dx}(a^{\lambda x})=$:	$a^{\lambda x}$	$a^{\lambda x}\cdot\ell na$	$\lambda a^{\lambda x}\cdot\ell na$	$\frac{a^{\lambda x}}{\lambda\ell na}$
15	$\frac{d}{dx}(\sin\sqrt{x})=$:	$\cos\sqrt{x}$	$\cos\sqrt{x}\cdot\frac{1}{\sqrt{x}}$	$\sqrt{x}\cos\sqrt{x}$	$\cos\sqrt{x}\cdot\frac{1}{2\sqrt{x}}$
16	$\frac{d}{dx}\left(\ell n(e^x)\right)=$:	$\frac{1}{e^x}$	e^x	1	e^{2x}
17	$\int\frac{1}{\cos^2 x}dx=$:	$\frac{1}{\sin^2 x}+c$	$\tan x+c$	$\sec^2 x+c$	$\csc^2 x+c$
18	Suitable substitution to evaluate $\int\frac{1}{\sqrt{x^2-a^2}}dx$ is :	$x=a\sin\theta$	$x=a\tan\theta$	$x=a\sec\theta$	$x=a\cos\theta$
19	$\int(\sec^2\theta-\tan^2\theta)\,d\theta=$:	$\theta+c$	$\sin\theta+\cos\theta+c$	$2\sec\theta-2\tan\theta+c$	$\tan\theta-\cot\theta+c$
20	$\int_{-\pi/4}^{\pi/4}\sec^2\theta\,d\theta=$	1	2	Zero	3

307-XII122522-17000

Intermediate Part Second

Roll No. ________

MATHEMATICS (Subjective) Group – I

Time: 02:30 Hours Marks: 80

SECTION – I

2. Attempt any EIGHT parts: 16

(i) Prove that $\operatorname{sech}^2 x = 1 - \tanh^2 x$

(ii) Find $f^{-1}(x)$ if $f(x) = (-x+9)^3$

(iii) Evaluate $\lim_{x \to \pi} \frac{\sin x}{\pi - x}$

(iv) Express the perimeter P of square as a function of its area A.

(v) Evaluate $\lim_{x \to 3} \frac{x-3}{\sqrt{x} - \sqrt{3}}$

(vi) Find the derivative of $y = \left(\sqrt{x} - \frac{1}{\sqrt{x}}\right)^2$ with respect to x

(vii) If $y = \sqrt{x + \sqrt{x}}$, then find $\frac{dy}{dx}$

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

(ix) Find $\frac{dy}{dx}$ if $y = x\, e^{\sin x}$

(x) If $f(x) = e^x(1 + \ell nx)$, find $f'(x)$

(xi) Determine the intervals in which $f(x) = x^2 + 3x + 2$, $x \in (-4, 1)$ is increasing.

(xii) If $y = \tanh(x^2)$, then find $\frac{dy}{dx}$

3. Attempt any EIGHT parts: 16

(i) Using differentials find $\frac{dy}{dx}$; $x^2 + 2y^2 = 16$

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

(iii) Evaluate $\int \frac{dx}{(x^2 + 4x + 13)}$

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

(v) Evaluate $\int e^{2x}[-\sin x + 2\cos x]\, dx$

(vi) Evaluate $\int \frac{3x+1}{x^2 - x + 6}\, dx$

(vii) Evaluate $\int_{-1}^{1} (x^{\frac{1}{3}} + 1)\, dx$

(viii) Find the area between the x-axis and the curve $y = x^2 + 1$ from $x = 1$ to $x = 2$

(ix) Find the points trisecting the join of $A(-1, 4)$ and $B(6, 2)$.

(x) Find an equation of the horizontal line through $(7, -9)$.

(xi) Convert $15y - 8x + 3 = 0$ in normal form.

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

4. Attempt any NINE parts: 18

(i) Define the optimal solution.

(ii) Indicate the solution set by shading of $2x + y \le 6$

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

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

(v) Write an equation of parabola with given elements : Directrix $x = -2$, Focus $(2, 2)$

(vi) Form the equation of ellipse from center $(0, 0)$; focus $(0, -3)$, vertex $(0, 4)$

(vii) Investigate the center and foci of $\frac{y^2}{16} - \frac{x^2}{9} = 1$

(Continued P/2)

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

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

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

(xi) Calculate area of the parallelogram whose vertices are P(0, 0, 0), Q(– 1, 2, 4), R(2, –1, 4) and S (1, 1, 8)

(xii) Prove that A(– 3, 5, – 4), B(–1, 1, 1), C(–1, 2, 2) and D(–3, 4, –5) are coplanar.

(xiii) Give 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 points B(2, 0, –2)

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

5. (a) For the real valued function $f(x) = (-x+9)^3$ find

(i) $f^{-1}(x)$ (ii) $f^{-1}(-1)$ and verify $f(f^{-1}(x)) = f^{-1}(f(x)) = x$ 05

(b) If $y = e^x \sin x$, show that $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 2y = 0$ 05

6. (a) Evaluate: $\int e^x \left(\frac{1+\sin x}{1+\cos x}\right) dx$ 05

(b) Find h such that the points A(h , 1) , B(2 , 7) and C(–6 , –7) are the vertices of right triangle with right angle at the vertex A. 05

7. (a) Evaluate $\int_0^{\frac{\pi}{4}} \cos^4 t \, dt$ 05

(b) Graph the feasible region of the linear inequality and also find corner points:

$x + y \le 5$, $-2x + y \le 2$, $x \ge 0$, $y \ge 0$ 05

8. (a) Find an equation of the line through the intersection of the lines $x + 2y + 3 = 0$, $3x + 4y + 7 = 0$ and making equal intercepts on the axes. 05

(b) Find an equation of the circle passing through A(– 3 , 1) with radius 2 and center at $2x - 3y + 3 = 0$ 05

9. (a) Find foci, center, vertices and directrices of hyperbola $4y^2 + 12y - x^2 + 4x + 1 = 0$ 05

(b) Find a unit vector perpendicular to plane containing $\vec{a}$ and $\vec{b}$. Also find the sine of angle between them. $\vec{a} = 2\hat{i} - 6\hat{j} - 3\hat{k}$, $\vec{b} = 4\hat{i} + 3\hat{j} - \hat{k}$ 05

307-XII122-17000

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	The lines represented by $ax^2+2hxy+by^2=0$ are parallel if:	$h^2-ab=0$	$h^2-ab>0$	$h^2-ab<0$	$h^2=a+b$
2	The slope intercept form of equation of line is:	$1=\frac{x}{a}+\frac{y}{b}$	$y=mx+c$	$y=\frac{x}{m}+c$	$y-y_1=m(x-x_1)$
3	Two lines ℓ_1 and ℓ_2 with slope m_1 and m_2 are parallel if:	$m_1=-m_2$	$m_1=m_2$	$m_1m_2=-1$	$m_1=\frac{1}{m_2}$
4	$x=5$ is not solution of inequality:	$x+4>0$	$2x+3<0$	$x-4>0$	$x+y>4$
5	The parametric equations $x=a\cos\theta$, $y=a\sin\theta$ represent equation of:	Circle	Ellipse	Hyperbola	Parabola
6	The length of tangent from (0 , 1) to circle $x^2+y^2+6x-3y+3=0$ is:	2	-2	1	3
7	For parabola value of eccentricity e is:	$e=0$	$e<1$	$e>1$	$e=1$
8	$\hat{\underline{i}}\cdot(\hat{\underline{j}}\times\hat{\underline{j}})=$:	1	i	0	2
9	If $\underline{u}$ is non-zero vector then $\underline{u}\cdot\underline{v}=$:	0	1	-1	u^2
10	A vector perpendicular to both vectors $\underline{a}$ and $\underline{b}$ is:	$\underline{a}\cdot\underline{b}$	$\underline{a}\times\underline{b}$	$\frac{\underline{a}\cdot\underline{b}}{\lvert\underline{a}\rvert}$	$\underline{b}\cdot\underline{a}$
11	$\lim_{n\to\infty}\left(1-\frac{1}{n}\right)^n=$:	e^{-1}	e	e^2	$\frac{1}{e^2}$
12	Domain of $f(x)=2+\sqrt{x-1}$, $\forall x\in R$ is:	$(-1,\infty)$	$(1,\infty)$	$(2,\infty)$	$(-2,\infty)$
13	If $f(x)=\cos x$ then $f'(\sin^{-1}x)=$:	$-\sin x$	$-x$	1	x
14	If $y=e^{2x}$ then $y_4=$:	$16e^{2x}$	$8e^{2x}$	$4e^{2x}$	$-16e^{2x}$
15	$\frac{1}{x}\frac{d}{dx}(\sin x^2)=$:	$2x\cos x^2$	$2\cos x^2$	$2x\sin x^2$	$\sin x^2$
16	If $y=5e^{3x-4}$ then $\frac{dy}{dx}=$:	$5e^{3x}$	e^{3x-4}	$15e^{3x-4}$	$5(3x-4)$
17	$\int\frac{a}{x}dx=$:	$ax+c$	$a\ell n\lvert x\rvert+c$	$-\frac{a}{x^2}+c$	$\frac{1}{a}\ell nx+c$
18	$\int e^x(\sin x+\cos x)\,dx=$:	$e^x\cos x+c$	$e^x\sin x$	$e^x\sin x+c$	$e^x\cos x$
19	$\int\sin 5x\,dx=$:	$-\frac{1}{a}\cos x$	$-\frac{1}{5}\cos 5x+c$	$\frac{1}{5}\sin x+c$	$\frac{1}{5}\cos 5x+c$
20	Solution of different equation $\frac{dy}{dx}=-y$ is:	$y=ce^x$	$y=ce^{-x}$	e^x	$\frac{1}{c}e^{-x}$

317-XII121-17000

Intermediate Part Second

Roll No. ________

MATHEMATICS (Subjective) Group – I

Time: 02:30 Hours Marks: 80

SECTION – I

2. Attempt any EIGHT parts: 16

(i) Find the domain and range of $g(x)=\sqrt{x^2-4}$

(ii) Find $f^{-1}(x)$ if $f(x)=\dfrac{2x+1}{x-1}$

(iii) Find $\lim\limits_{x\to a}\dfrac{x^n-a^n}{x^m-a^m}$

(iv) Find $\lim\limits_{x\to 0}\dfrac{e^{\frac{1}{x}}-1}{e^{\frac{1}{x}}+1}$, $x>0$

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

(vi) Differentiate $\sin x$ w.r.t. $\cot x$

(vii) Find $\dfrac{dy}{dx}$ if $x^2-4xy-5y=0$

(viii) If $f(x)=\ell n\sqrt{e^{2x}+e^{-2x}}$, find $f'(x)$

(ix) If $y=\ell n(\tanh x)$, find $\dfrac{dy}{dx}$

(x) If $y=x^2\,\ell n\left(\dfrac{1}{x}\right)$, find $\dfrac{dy}{dx}$

(xi) If $x=a(\cos t+\sin t)$, $y=a(\sin t-t\cos t)$, find $\dfrac{dy}{dx}$

(xii) Apply Maclaurin series prove that $e^{2x}=1+2x+4\dfrac{x^2}{2!}+\ldots$

3. Attempt any EIGHT parts: 16

(i) Use differential to approximate the value of $\sqrt{17}$

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

(iii) Evaluate $\int\left(\sqrt{x}+\dfrac{1}{\sqrt{x}}\right)dx$

(iv) Evaluate $\int \tan^2 x\,dx$

(v) Evaluate $\int \dfrac{\sec^2 x}{\sqrt{\tan x}}\,dx$

(vi) Evaluate $\int \ell nx\,dx$

(vii) Evaluate $\int_0^{\frac{\pi}{6}} x\cos x\,dx$

(viii) Solve the differential equation $y\,dx+x\,dy=0$

(ix) Find the coordinates of the point that divides the join of $A(-6,3)$ and $B(5,-2)$ in the ratio $2:3$ internally.

(x) By means of slopes th... the points $(4,-5)$, $(7,5)$ and $(10,15)$ lie on the same line.

(xi) Fi... e with y-intercept: -7 and slope: -5.

...y $2x^2+3xy-5y^2=0$

(Continued P/2)

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

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

(ii) Find equation of circle with center at $(\sqrt{2}, -3\sqrt{3})$ and radius $2\sqrt{2}$

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

(iv) Find vertex and directrix of parabola $x^2=-16y$

(v) Find equation of parabola with focus $(-3, 1)$ and directrix $x = 3$

(vi) Find center and foci of $\frac{x^2}{4}-\frac{y^2}{9}=1$

(vii) Find eccentricity and vertex of $\frac{y^2}{16}-\frac{x^2}{9}=1$

(viii) Write the vector $\overline{PQ}$ in the form $x\underline{i}+y\underline{j}$, P(2, 3), Q(6, –2)

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

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

(xi) Find a real number α so that $\underline{u}=\alpha\underline{i}+2\alpha\underline{j}-\underline{k}$, $\underline{v}=\underline{i}+\alpha\underline{j}+3\underline{k}$ are perpendicular.

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

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

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

5. (a) Evaluate $\lim_{\theta \to 0} \frac{\tan\theta-\sin\theta}{\sin^3\theta}$ 05

(b) Show that $\frac{dy}{dx}=\frac{y}{x}$ if $\frac{y}{x}=\tan^{-1}\frac{x}{y}$ 05

6. (a) Solve $\int e^{-x}\sin 2x\,dx$ 05

(b) Find the angles of the triangle whose vertices are A(–5, 4), B(–2, –1) and C(7, –5) 05

7. (a) Evaluate $\int_0^{\frac{\pi}{4}} \cos^4 t\,dt$ 05

(b) Maximize $f(x, y) = x + 3y$ subject to the constraints: $2x+5y\leq 30$; $5x+4y\leq 20$; $x\geq 0$, $y\geq 0$ 05

8. (a) Write an equation of circle passing through the points A(–7, 7), B(5, –1), C(10, 0) 05

(b) Given force $\vec{F}=2i+j-3k$ acting at a point A(1, –2, 1) find the moment of $\vec{F}$ about the point B(2, 0, –2) 05

9. (a) Show that $y=\frac{\ell nx}{x}$ has maximum value at $x = e$ 05

(b) Show that the ordinate at any point P of the parabola is a mean proportional between the length of the latus rectum and the abscissa of P. 05

317-XII121-17000

Roll No. : ____________

Objective
Paper Code
8198

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 altitudes of a triangle are:	Concurrent	Parallel	Perpendicular	Imaginary
2	The line $y = 3x$ passes through:	Origin	$(4, 3)$	$(3, 1)$	$(0, 3)$
3	A quadrilateral having two parallel and two non-parallel sides is called:	Parallelogram	Rhombus	Trapezium	Triangle
4	The maximum or minimum values of objective function occur at corner points of the feasible region, is called:	The theorem of linear programming	Feasible theorem	Optional theorem	Convex
5	The focus of $y^2 = -4ax$ is:	$(0, 0)$	$(a, 0)$	$(-a, 0)$	(a, a)
6	The eccentricity of parabola is:	0	1	Less than one	Not defined
7	The center of $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is:	$(0, 0)$	$(a, 0)$	$(0, b)$	(a, b)
8	If $\bar{u}$, $\bar{v}$ and $\bar{w}$ are coplaner vectors than the volume of the parallelopiped so formed is:	1	0	$\lvert u \times v \times w \rvert$	$\sqrt{u^2 + v^2 + w^2}$
9	The magnitude of $\bar{u} = i + j$ is:	$2\sqrt{i^2 + j^2}$	2	$\sqrt{2}$	$\frac{\hat{i} + \hat{j}}{\sqrt{2}}$
10	The unit vector in the direction of $2i - j$ is:	5	$\sqrt{5}$	$\frac{2i - j}{5}$	$\frac{2i - j}{\sqrt{5}}$
11	A function $C : R \to R$ defined by $C(x) = 2$ for all $x \in R$ is called:	Domain	Range	Constant function	Objective function
12	For the function $f(x) = x^n$, $\lim_{x \to a} \frac{x^n - a^n}{x - a} =$:	nx^{n-1}	na^{n-1}	0	∞
13	If $f(x) = \lvert x \rvert$ then $f'(0) =$:	0	1	-1	Does not exist
14	The sum of two integers is 9. If one integer is x, then other will be:	$9x$	$9 - x$	$x - 9$	$x + 9$
15	The derivative of arc cos x is:	$\frac{-1}{\sqrt{1 - x^2}}$	$\frac{1}{\sqrt{1 + x^2}}$	$\frac{1}{\sqrt{x^2 - 1}}$	$\frac{-1}{\sqrt{x^2 - 1}}$
16	The first term of Taylor Series Expansion of $\ln(1 + x)$ at $x = 2$ is:	$\ln 3$	$\ln 2$	$\ln 1$	$\ln 0$
17	$\int \tan x \, dx =$:	$\sec^2 x$	$\sec x \tan x$	$\ln \sec x$	$\ln \cos x$
18	The suitable substitution to integrate $\sqrt{x^2 - a^2}$:	$x = a \sin\theta$	$x = a \cos\theta$	$x = a \sec\theta$	$x = a \tan\theta$
19	$\int e^{ax}[af(x) + f'(x)] dx =$:	$e^{ax} f(x)$	$e^{ax} a \cdot f(x)$	$e^{ax} f'(x)$	$a f'(x)$
20	$\int \frac{2}{x + 2} dx =$:	$\ln \lvert x + 2 \rvert$	$\ln \lvert x + 2 \rvert^2$	$\frac{1}{\ln \lvert x + 2 \rvert}$	2

318-XII121-20000

Intermediate Part Second

Roll No. ________

MATHEMATICS (Subjective) Group – II

Time: 02:30 Hours Marks: 80

SECTION – I

2. Attempt any EIGHT parts: 16

(i) Determine whether the function is even or odd for $f(x)=x^{\frac{2}{3}}+6$

(ii) Without finding inverse state domain and range of $f(x)=\frac{x-1}{x-4},\ x\neq 4$

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

(iv) Show that $x=at^2,\ y=2at$ represent parametric equation of $y^2=4ax$

(v) Differentiate w.r.t. 'x' if $y=\frac{x^2+1}{x^2-3}$

(vi) Differentiate $x^2-\frac{1}{x^2}$ w.r.t. x^4

(vii) Find $\frac{dy}{dx}$ if $y=xe^{\sin x}$

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

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

(x) Differentiate w.r.t. x, $\sin^{-1}\sqrt{1-x^2}$

(xi) Find $\frac{dy}{dx}$ if $y=e^{-2x}\sin 2x$

(xii) Find y_4 if $y=\ell n(x^2-9)$

3. Attempt any EIGHT parts: 16

(i) Using differentials find $\frac{dy}{dx}$ when $\frac{y}{x}-\ell nx=\ell nc$

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

(iii) Evaluate the indefinite integral $\int\frac{(\sqrt{\theta}-1)^2}{\sqrt{\theta}}d\theta$

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

(v) Find the antiderivative of $x\ell nx$

(vi) ~~Evaluate the given integral $\int\sec^4 x\,dx$~~

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

(viii) Find the area, above the x-axis and under the curve $y=5-x^2$ from $x=-1$ to $x=2$

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

(x) Convert the given equation into normal form: $15y-8x+3=0$

(xi) Find the interior angles (any two) of the triangle whose vertices are $A(2,-5)$, $B(-4,-3)$, $C(-1,5)$

(xii) Find an equation of each of the lines represented by $2x^2+3xy-5y^2=0$

(Continued P/2)

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

(i) Graph the solution set of $2x + y \leq 6$ by shading.

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

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

(iv) If $\underline{v} = 3\underline{i} - 2\underline{j} + 2\underline{k}$ and $\underline{w} = 5\underline{i} - \underline{j} + 3\underline{k}$, then find $|3\underline{v} + \underline{w}|$

(v) Find a unit vector perpendicular to plane containing $\underline{a}$ and $\underline{b}$ and $\underline{a} = -\underline{i} - \underline{j} - \underline{k}$, $\underline{b} = 2\underline{i} - 3\underline{j} + 4\underline{k}$

(vi) Compute cross product, $\underline{a} \times \underline{b}$, $\underline{b} \times \underline{a}$, if $\underline{a} = -4\underline{i} + \underline{j} - 2\underline{k}$ and $\underline{b} = 2\underline{i} + \underline{j} + \underline{k}$

(vii) Find work done, if the point at which the constant force $\underline{F} = 4\underline{i} + 3\underline{j} + 5\underline{k}$ is applied to an object moves from $P_1(3, 1, -2)$ to $P_2(2, 4, 6)$

(viii) Find an equation of circle with center at $(\sqrt{2}, -3\sqrt{3})$ and radius is $2\sqrt{2}$

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

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

(xi) Find center and eccentricity of $4y^2 + 12y - x^2 + 4x + 1 = 0$.

(xii) Define circle and just write its standard equation.

(xiii) Find equation of tangent to the circle $4x^2 + 3y^2 + 5x - 13y + 2 = 0$ at $\left(1, \frac{10}{3}\right)$.

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

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

(b) Differentiate ab-initio w.r.t. 'x'; $\sin\sqrt{x}$ 05

6. (a) Evaluate $\int \frac{\sqrt{2}}{\sin x + \cos x} dx$ 05

(b) Find the condition that lines $y = m_1x + c_1$, $y = m_2x + c_2$ and $y = m_3x + c_3$ are concurrent. 05

7. (a) Evaluate $\int_0^{\frac{\pi}{4}} \frac{\sin x - 1}{\cos^2 x} dx$ 05

(b) Maximize $f(x, y) = 2x + 5y$ subject to the constraints: $2y - x \leq 8$, $x - y \leq 4$, $x \geq 0$, $y \geq 0$ 05

8. (a) Find an equation of a circle which passes through $A(-3, 1)$ with radius 2 and center at $2x - 3y + 3 = 0$ 05

(b) If $\underline{a} + \underline{b} + \underline{c} = 0$ then prove that $\underline{a} \times \underline{b} = \underline{b} \times \underline{c} = \underline{c} \times \underline{a}$ 05

9. (a) If $y = a\cos(\ell n x) + b\sin(\ell n x)$ prove that $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = 0$ 05

(b) Find the center, foci and vertices of hyperbola $9x^2 - y^2 - 36x - 6y + 18 = 0$ 05

318-XII121-20000

Faisalabad Board-2019

Roll No. : __________

ective
r Code
197

Intermediate Part Second

MATHEMATICS (Objective) Group – I

Time: 30 Minutes Marks: 20

Q.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.

	Questions	A	B	C	D
1	$\int e^x(\cos x+\sin x)\,dx =$:	$e^x \cos x$	$e^x \sin x$	$e^x \tan x$	$\ell n(\sin x)$
2	$\int (4-x^2)^{-\frac{1}{2}}(-2x)\,dx =$:	$2\sqrt{4-x^2}$	$\frac{1}{2}\sqrt{4-x^2}$	$\ell n(4-x^2)$	$\ell n\sqrt{4-x^2}$
3	$\int \ell nx\,dx =$:	$\frac{1}{x}$	$\frac{(\ell nx)^2}{2}$	$x\ell nx$	$x\ell nx - x + c$
4	$\int_0^x 3t^2\,dt =$:	t^3	$\frac{t^3}{3}$	x^3	0
5	$\frac{1}{\sqrt{x^2-1}}$ is derivative of:	$\sinh^{-1} x$	$\cosh^{-1} x$	$\tanh^{-1} x$	$\coth^{-1} x$
6	$\frac{d}{dx}(\ell n \cos x) =$:	$\tan x$	$\cot x$	$-\tan x$	$-\cot x$
7	If $y = \cosh x$, then $\frac{dy}{dx} =$:	$-\sinh x$	$\sinh y$	$-\cosh x$	$\sinh x$
8	$\frac{d}{dx}(f(u)) =$:	$f'(u)$	$f(du)$	$f'(u)\frac{du}{dx}$	$f'(u)du$
9	If $f(x) = 2x - 8$, then $f^{-1}(x) =$:	$8-2x$	$8+2x$	$\frac{x+8}{2}$	$\frac{x-8}{2}$
10	The function $x^2+xy+y^2=2$ is a (an):	Constant function	Even function	Implicit function	Explicit function
11	$\lvert \underline{a} \times \underline{b} \rvert$ calculates the area of:	Triangle	Parallelogram	Tetrahedron	Parallelopiped
12	$\hat{k} \times \hat{i} =$:	$2\hat{i}$	$-\hat{i}$	$\hat{j}$	$-\hat{j}$
13	The end-points of minor axis of an ellipse are called:	Foci	Vertices	Covertices	Center
14	The vertex of the parabola $y^2 + 16x$ is:	(0 , 0)	(1 , 0)	(0 , 1)	(1 , 1)
15	The center of the circle $(x-1)^2+(y+3)^2=9$ is:	(−1 , 3)	(−1 , −3)	(1 , 3)	(1 , −3)
16	The solution of the inequality $2x + y < 5$ is:	(1 , 2)	(2 , 1)	(2 , 3)	(5 , 0)
17	The perpendicular distance of a line $12x+5y-7=0$ from origin is:	$\frac{1}{13}$	$\frac{13}{7}$	$\frac{7}{13}$	13
18	The equation of line $\frac{x}{a}+\frac{y}{b}=1$ is:	Normal form	Intercepts form	Point-slope form	Two-points form
19	The line $2x - y - 4 = 0$ cuts x-axis at point:	(2 , 0)	(0 , −2)	(0 , −4)	(4 , 0)
20	The distance between two points A(−8 , 3), B(2 , −1) is:	116	(−6 , 2)	$2\sqrt{29}$	$\sqrt{58}$

317-XII119-12000

Intermediate Part Second

Roll No. ________

MATHEMATICS (Subjective) Group – I

Time: 02:30 Hours Marks: 80

SECTION – I

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

(i) Define exponential function.

(ii) $f(x) = 2x + 1$, $g(x) = x^2 - 1$, find $g(f(x))$

(iii) Prove the identity $\cosh^2 x + \sinh^2 x = \cosh 2x$

(iv) Find by definition derivative of $\frac{1}{x - a}$

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

(vi) Find $\frac{dy}{dx}$ by making suitable substitution if $y = \sqrt{x + \sqrt{x}}$

(vii) Prove that $\frac{d}{dx}(\cos^{-1} x) = -\frac{1}{\sqrt{1 - x^2}}$

(viii) Differentiate $\sin^3 x$ w.r.t. $\cos^3 x$

(ix) Find $\frac{dy}{dx}$ if $y = e^{-2x} \sin 2x$

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

(xi) Apply the Maclaurin series, prove $e^{2x} = 1 + 2x + 2x^2 + \dots\dots$

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

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

(i) Find δy and dy of function $f(x) = x^2$ when $x = 2$ and $dx = 0.01$

(ii) Using differential find $\frac{dy}{dx}$ if $xy - \ln x = c$

(iii) Evaluate $\int (x+1)(x-3)\, dx$

(iv) Evaluate $\int \frac{1}{\sqrt{x}\,(\sqrt{x}+1)}\, dx$

(v) Evaluate $\int \frac{1}{1 + \cos x}\, dx$, $\left(-\frac{\pi}{2} < x < \frac{\pi}{2}\right)$

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

(vii) Evaluate $\int x \ln x\, dx$

(viii) Evaluate $\int x \sin x\, dx$

(ix) Evaluate $\int_{-1}^{3} (x^3 + 3x^2)\, dx$

(x) Evaluate $\int_{0}^{3} \frac{dx}{x^2 + 9}$

(xi) Define objective function.

(xii) Graph the solution set of linear inequality $2x + y \le 6$

(Continued P/2)

Attempt any NINE parts: 18

(i) Find the point trisecting the join of A (– 1 , 4) and B (6 , 2)

(ii) Find an equation of the line through A (– 6 , 5) having slope 7

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

(iv) Define the homogeneous equation.

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

(vi) Find the equation of axis and focus of parabola $x^2 = -16y$

(vii) Find the foci of the ellipse $25x^2 + 9y^2 = 225$

(viii) Find the equations of directrices of hyperbola $\frac{x^2}{4} - \frac{y^2}{9} = 1$

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

(x) Define the direction cosines of a vector.

(xi) Find a unit vector in the direction of $\vec{V} = \underline{i} + 2\underline{j} - \underline{k}$

(xii) Find a 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.

(xiii) If $\vec{a} + \vec{b} + \vec{c} = 0$ then prove that $\vec{a} \times \vec{b} = \vec{b} \times \vec{c} = \vec{c} \times \vec{a}$

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

. (a) Find m and n so that the given function f is continuous at x = 3 $f(x) = \begin{cases} mx & \text{if } x < 3 \\ n & \text{if } x = 3 \\ -2x + 9 & \text{if } x > 3 \end{cases}$ 05

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

. (a) Evaluate $\int \frac{x - 2}{(x + 1)(x^2 + 1)} dx$ 05

(b) The average entry test score of engineering candidates was 592 in the year 1998 while the score was 564 in 2002. Assuming that the relationship between time and score is linear, find the average score for 2006. 05

. (a) Find the area bounded by curve $y = x^3 - 4x$ and the x-axis. 05

(b) Maximize : $f(x, y) = 2x + 5y$ subject to
Constraints : $2y - x \le 8$, $x - y \le 4$, $x \ge 0$, $y \ge 0$ 05

. (a) The vertices of a triangle are A (–2 , 3) , B (–4 , 1) and C (3 , 5). Find coordinates of the orthocenter of the triangle. 05

(b) Show that the lines $3x - 2y = 0$ and $2x + 3y - 13 = 0$ are tangents to the circle $x^2 + y^2 + 6x - 4y = 0$ 05

. (a) Find the equations of tangent and normal to the conic $\frac{x^2}{8} + \frac{y^2}{9} = 1$ at the point $\left(\frac{8}{3}, 1\right)$ 05

(b) Prove that $\cos(\alpha + \beta) = \cos\alpha \cos\beta - \sin\alpha \sin\beta$ 05

317-XII119-12000

Roll No. : ____________

Objective
Paper Code
8194

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 lines through origin represented by $ax^2+2hxy+by^2=0$ are coincident if:	$h^2=ab$	$h^2+ab=0$	$h^2-ab>0$	$h^2-ab<0$
2	Slope of the line parallel to x-axis is:	Undefined	1	0	–1
3	Distance of the point (–2 , 3) from y-axis is:	2	–2	3	–3
4	Intercept form of equation of a line is:	$\frac{x}{a}-\frac{y}{b}=0$	$\frac{x}{a}+\frac{y}{b}=0$	$\frac{x}{a}-\frac{y}{b}=4$	$\frac{x}{a}+\frac{y}{b}=1$
5	(1 , 0) is not the solution of the inequality:	$x-3y<0$	$7x+2y<8$	$3x+5y<7$	$4x-3y<9$
6	Two circles are said to be concentric circles if they have:	Same radius	Different center	Same center	Same diameter
7	The latus rectum of the parabola $y^2=-4ax$ is:	$x=a$	$x=-a$	$y=a$	$y=-a$
8	The two separate parts of hyperbola are called:	Foci	Vertices	Directrices	Branches
9	$\underline{i}\times\underline{k}=$:	$-\underline{j}$	1	$\underline{j}$	0
10	The position vector of any point in xy-plane is:	$x\underline{i}+y\underline{j}+z\underline{k}$	$y\underline{j}+z\underline{k}$	$x\underline{i}+y\underline{j}$	$x\underline{i}+z\underline{k}$
11	Cosh 2x = :	$\frac{e^{2x}-e^{-2x}}{2}$	$\frac{e^{2x}+e^{-2x}}{2}$	$\frac{e^{x}+e^{-x}}{2}$	$\frac{e^{2x}-e^{-2x}}{e^{2x}+e^{-2x}}$
12	$\lim_{n\to+\infty}\left(1+\frac{1}{n}\right)^{2n}=$:	e	e^2	e^4	e^6
13	The notation used for derivative of f(x) by Cauchy is:	Df(x)	f′(x)	$\dot{f}(x)$	$\frac{df}{dx}$
14	If $y=\ell nx$ then $y_2=$:	$\frac{1}{x}$	$\frac{-1}{x}$	$\frac{-1}{x^2}$	$\frac{1}{x^2}$
15	$\frac{d}{dx}(e^{\sin x})=$:	cos x	$e^{\sin x}\cos x$	$e^{\sin x}\sin x$	sin x
16	$\frac{d}{dx}(\tan^{-1}3x)=$:	$\frac{1}{1+3x}$	$\frac{3}{1+3x}$	$\frac{1}{1+9x^2}$	$\frac{3}{1+9x^2}$
17	$\int x^{-1}dx=$:	$\ell nx+c$	$\frac{x^{-2}}{2}$	$-x^{-2}$	0
18	$\int e^x\left[\sinh^{-1}x+\frac{1}{\sqrt{1+x^2}}\right]dx=$:	$e^x\cosh^{-1}x$	$e^x\cos^{-1}x$	$e^x\sinh^{-1}x$	$e^x\sin^{-1}x$
19	$\int_0^1\frac{1}{1+x^2}dx=$:	$\frac{\pi}{3}$	$\frac{\pi}{4}$	$\frac{\pi}{2}$	$\frac{\pi}{6}$
20	$\int\tan x\sec^2x\,dx=$:	$\tan x+c$	$\sec^2x+c$	$\sec x+c$	$\frac{\tan^2x}{2}+c$

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Intermediate Part Second

Roll No. ________

MATHEMATICS (Subjective) Group – II

Time: 02:30 Hours Marks: 80

SECTION – I

Attempt any EIGHT parts: 16

(i) Define implicit function.

(ii) Prove the identity $\text{sech}^2 x = 1 - \tanh^2 x$

(iii) Find $\lim\limits_{n \to 0} \dfrac{e^{\frac{1}{x}} - 1}{e^{\frac{1}{x}} + 1}$, $x > 0$

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

(v) Differentiate w.r.t. x if $y = \dfrac{2x-3}{2x+1}$

(vi) Differentiate $x^2 - \dfrac{1}{x^2}$ w.r.t. x^4

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

(viii) Find $\dfrac{dy}{dx}$ if $y = x \cos y$

(ix) Differentiate $y = a^{\sqrt{x}}$

(x) Find $\dfrac{dy}{dx}$ if $y = \ell n(\tanh x)$

(xi) Define point of inflexion of a function.

(xii) Determine $f(x) = \sin x$ is increasing or decreasing in the interval $\left(0, \dfrac{\pi}{2}\right)$.

Attempt any EIGHT parts: 16

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

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

(iii) Integrate by substitution $\int \dfrac{x}{\sqrt{4+x^2}} dx$

(iv) Find the integral $\int \dfrac{\sqrt{2}}{\sin x + \cos x} dx$

(v) Evaluate the integral by parts $\int \ell nx \, dx$

(vi) Find indefinite integral $\int \dfrac{1}{\sqrt{a^2 - x^2}} dx$ by substitution

(vii) Evaluate $\int \dfrac{2a}{x^2 - a^2} dx$, $x > a$ by partial fraction

(viii) What is the definition of definite integral?

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

(x) Define order of a differential equation.

(xi) What do you know about half planes?

(xii) Graph the linear inequality $2x + 3 \geq 0$

(Continued P/2)

Attempt any NINE parts: 18

(i) Find the point P on the join of A (1 , 4) and B (5 , 6) that is twice as far from A as B is from A and lies on the same side of A as B does.
(ii) Show that the points A (− 3 , 6) , B (3 , 2) and C (6 , 0) are collinear.
(iii) Find an equation of the line through the points A (− 5 , − 3) and B (9 , − 1)
(iv) Find separate equations of lines represented by $6x^2 - 19xy + 15y^2 = 0$
(v) Define eccentricity of the conic.
(vi) Find equation of parabola with focus (− 1 , 0) , vertex (− 1 , 2)
(vii) Find equation of hyperbola with foci (± 5 , 0) vertex (3 , 0)
(viii) Define a circle.
(ix) Find sum of vectors $\overrightarrow{AB}$ and $\overrightarrow{CD}$ if A (1 , − 1) , B (2 , 0) , C (− 1 , 3) , D (− 2 , 2).
(x) Find a vector whose magnitude is 2 and is parallel to $-\underline{i} + \underline{j} + \underline{k}$
(xi) Find a 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) Find area of triangle formed by P, Q, R if P (0 , 0 , 0) , Q (2 , 3 , 2) , R (− 1 , 1 , 4)
(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 coplanar.

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

(a) Prove that $\lim_{x \to 0} \dfrac{a^x - 1}{x} = \log_e a$; $a > 0$ 05

(b) If $x = a(\theta - \sin\theta)$; $y = a(1 + \cos\theta)$ then prove that $y^2 \dfrac{d^2y}{dx^2} + a = 0$ 05

(a) Evaluate $\int \tan^3 x \sec x \, dx$ 05

(b) Find the equations of two parallel lines perpendicular to $2x - y + 3 = 0$ such that the product of the x- and y-intercepts of each is 3. 05

(a) Evaluate $\int_0^{\sqrt{3}} \dfrac{x^3 + 9x + 1}{x^2 + 9} \, dx$ 05

(b) Indicate the solution region of the following system of linear inequalities by shading:
$3x + 7y \leq 21$, $2x - y \geq -3$, $x \geq 0$ 05

(a) Find an equation of the line through the intersection of $16x - 10y - 33 = 0$, $12x + 14y + 29 = 0$ and the intersection of $x - y - 4 = 0$, $x - 7y + 2 = 0$ 05

(b) Write the equations of tangent and normal to the circle $x^2 + y^2 = 25$ at the point (4 , 3) 05

(a) Show that the ordinate at any point P of the parabola is mean proportional between the length of Latus rectum and abscissa of P. 05

(b) Prove that $\sin(\alpha + \beta) = \sin\alpha \cos\beta + \cos\alpha \sin\beta$ 05

Roll No. : ________

Objective
Paper Code
8191

Intermediate Part Second

MATHEMATICS (Objective)

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 parametric equations $x = a\sec\theta$ and $y = b\tan\theta$ represent the equation of:	Hyperbola	Circle	Parabola	Ellipse
2	$\lim_{n\to+\infty}\left(1+\frac{3}{n}\right)^{2n} =$	e	e^2	e^3	e^6
3	$\frac{d}{dx}\left(\frac{1}{x^2}\right)$ at $x = 1$ is =	-2	2	1	-1
4	$\frac{d}{dx}(\sin^{-1}x) =$	$\frac{-1}{\sqrt{1-x^2}}$	$\frac{1}{\sqrt{1+x^2}}$	$\frac{1}{\sqrt{1-x^2}}$	$\frac{-1}{\sqrt{1+x^2}}$
5	$\frac{d}{dx}(\sec^{-1}x + \operatorname{cosec}^{-1}x) =$	1	-1	0	2
6	$\frac{d}{dx}(5^x) =$	5^x	$5^x \cdot \ln 5$	$\frac{5^x}{\ln 5}$	$5(5^x)$
7	$\int \frac{d}{dx}(x^n)\,dx =$	$\frac{x^{n+1}}{n+1}+c$	$n x^{n-1}+c$	$\frac{x^{n+1}}{n}+c$	$x^n + c$
8	$\int\frac{\sec^2 x}{\tan x}dx - \int\frac{\operatorname{cosec}^2 x}{\cot x}dx =$	0	$2\ln\tan x + c$	$2\ln\cot x + c$	$\ln\cot x + c$
9	$\int \sec^2 x\,dx =$	$\cot x + c$	$\tan x + c$	$\sec x + c$	$\operatorname{cosec} x + c$
10	$\int_{-1}^{2} x\,dx =$	$\frac{1}{2}$	$-\frac{1}{2}$	$\frac{3}{2}$	$-\frac{3}{2}$
11	Distance of the points (2 , 3) from y-axis is:	2	3	5	$\sqrt{13}$
12	The point of intersection of medians of a triangle is called:	Circumcenter	Orthocenter	Centroid	In-center
13	If m_1 and m_2 are slopes of two lines then lines are perpendicular if:	$m_1 m_2 = 0$	$m_1 m_2 + 1 = 0$	$m_1 m_2 - 1 = 0$	$m_1 + m_2 = 0$
14	Two lines represented by $ax^2 + 2bxy + by^2 = 0$ are orthogonal if:	$a - b = 0$	$a + b = 0$	$a + b > 0$	$a + b < 0$
15	(1 , 2) is one of the solution of inequality:	$2x + y > 5$	$2x - y \geq 5$	$2x + y < 3$	$2x + y < 5$
16	Vertex of the parabola $y^2 = 4ax$ is:	$(0, 0)$	$(a, 0)$	$(0, a)$	(a, a)
17	Vertices of $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ $a > b$ are:	$(\pm a, 0)$	$(0, \pm a)$	$(0, \pm b)$	$(\pm b, 0)$
18	The length of latus-rectum of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ is:	$\frac{b^2}{a}$	$\frac{2b^2}{a}$	$\frac{2a^2}{b}$	$\frac{a^2}{b}$
19	If any two vectors of scalar triple product are equal then its value is:	1	2	-1	0
20	The non-zero vectors $\underline{a}$ and $\underline{b}$ are parallel if $\underline{a}\times\underline{b} =$	0	1	-1	(a, b)

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Intermediate Part Second Roll No. ________

MATHEMATICS (Subjective)

Time: 02:30 Hours Marks: 80

SECTION – I

2. Attempt any EIGHT parts: 16

(i) Find gog(x) if $g(x)=\frac{3}{x-1}, x\neq 1$

(ii) Evaluate $\lim\limits_{x\to 0}\frac{\sin x^0}{x}$

(iii) Find value of m so that f is continuous at x = 3 : $f(x)=\begin{cases} mx & \text{if } x<3 \\ x^2 & \text{if } x\geq 3\end{cases}$

(iv) Find the derivative of $y=(x^2+5)(x^3+7)$ w.r.t. 'x'

(v) Find $\frac{dy}{dx}$ if $x=at^2$, $y=2at$

(vi) Differentiate $x^2\sec 4x$ w.r.t. 'x'

(vii) Differentiate w.r.t. $x:\cot^{-1}\frac{x}{a}$

(viii) Find $f'(x)$ if $f(x)=e^x(1+\ell nx)$

(ix) Find y_4 if $y=\ell n(x^2-9)$

(x) Define relative maxima.

(xi) If $f(x)=\frac{1}{12}x^4-\frac{1}{6}x^3+\frac{1}{4}x^2+2x+7$, find $f^{iv}(x)$

(xii) If $y=\tan h(x^2)$, find $\frac{dy}{dx}$

3. Attempt any EIGHT parts: 16

(i) Find $\frac{dy}{dx}$ using differentials, if $x^3+y^2=xy^2$

(ii) Evaluate the integral $\int\frac{dx}{\sqrt{x+1}-\sqrt{x}}$

(iii) Evaluate the integral $\int\frac{dx}{x(\ell n\, 2x)^3}$

(iv) Evaluate the integral $\int x\cos x\, dx$

(v) Evaluate the integral $\int x^2\tan^{-1}x\, dx$

(vi) Evaluate the integral $\int x^2e^{ax}\, dx$

(vii) State the fundamental theorem of calculus.

(viii) Evaluate the definite integral $\int_2^{\sqrt{5}} x\sqrt{x^2-1}\, dx$

(ix) Evaluate the definite integral $\int_{-\pi}^{\pi}\sin x\, dx$

(x) Solve the differential equation $\frac{dy}{dx}=\frac{1-x}{y}$

(xi) State the linear programming theorem.

(xii) Graph the region $x-y\leq 3$; $x+2y\leq 6$

(Continued P/2)