Roll No. : __________

FSD-1-24

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:	$y=mx+c$	$x\sin(90°-\alpha)+y\cos(90°-\alpha)=p$	$\frac{x}{a}+\frac{y}{b}=1$	$x=\frac{y}{2}-\frac{5}{2}$
4	$ax+b>0$ is:	An identity	A linear equation	[illegible]	Inequality
5	For hyperbola $b^2=?$	c^2-a^2	a^2- [illegible]	[illegible] a^2	$ac-1$
6	Parametric equations of a circle are:	$x=a\cos\theta$, $y=b\sin\theta$	[illegible]	$x=a\cos\theta$, $y=a\sin\theta$	$x=b\cos\theta$, $y=a\sin\theta$
7	The equation $ax^2+by^2+2gx+2fy+c=0$ will represent circle if:	a [illegible]	[illegible] $a=b$	$a>b$	$a\neq b$
8	If terminal point B of vector AB coincides with its initial point A, then such a vector is call[illegible]	[illegible]	Unit vector	Coincident vector	Free vector
9	If α,β,γ are direction angles of a [illegible]	$0<\alpha<\frac{\pi}{2}$	$0\le\alpha\le\frac{\pi}{2}$	$0<\alpha<\pi$	$0\le\alpha\le\pi$
10	If $\bar{u}=a\hat{i}+b\hat{j}+c\hat{k}$, then [illegible] $\hat{k}$ is equal to:	a	b	c	$\bar{u}\cdot\hat{k}$
11	The equations [illegible] $=a\cos\theta$, $y=a\sin\theta$ are [illegible]	Implicit equations	Explicit equations	Parametric equations	Homogeneous equations
12	Domain of $f(x)=2+\sqrt{x-1}\;\forall x\in\mathbb{R}$ 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	$\int\ell n\,x\,dx=?$	$x\ell nx+c$	$x\ell nx-x+c$	$x\ell nx+x+c$	$\ell nx+x+c$

[redacted]

1209-XII124

Intermediate Part Second

MATHEMATICS (Subjective) Group – I

Roll No. ________

Time: 02:30 Hours Marks: 80 FSD-1-24

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

(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 $e^x = 1 + x + \frac{x^2}{2!} + x^3$ [illegible]

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

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

(i) Use differentials, find $\frac{dy}{dx}$ and [illegible] $= 16$

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

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

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

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

(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)

F

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

(i) Graph the solution set of linear inequality $5x - 4y \le 20$ 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) [illegible]

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

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

5. (a) If $f(x) = \begin{cases} \frac{\sqrt{2x+5} - \sqrt{x+7}}{x-2}, & x \ne 2, \\ k, & x = 2 \end{cases}$ find the value of [illegible] continuous at x = 2. 05

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

6. (a) Show that $y = x^x$ has minimum [illegible] $\frac{\ }{e}$ 05

(b) Evaluate: $\int \frac{dx}{(1+ \ldots}$ [illegible] 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 $3x + 5y \ge 15$; $x + 3y \ge 9$, $x, y \ge 0$ 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

[redacted]