Roll No. of Candidate _____

Mathematics **(INTER PART II)-419-(III)** **PAPER: II** **GROUP: I**
Time: 30 Minutes **Code: 8195** **Marks: 20**
OBJECTIVE

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. Attempt as many questions as given in objective type question paper and leave others blank.

1- 1- If A(–3, 6) and B(3, 2), then slope of AB is

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

2- $\int_a^b 3t^2\,dt =$

(A) $a^3 - b^3$ (B) $a^3 + b^3$ (C) $b^3 - a^3$ (D) $\frac{b^3+a^3}{3}$

3- If $\overrightarrow{OA} = \vec{a}$, $\overrightarrow{OB} = \vec{b}$, then $\overrightarrow{AB}$ =

(A) $\vec{a} - \vec{b}$ (B) $\vec{a} + \vec{b}$ (C) $\vec{b} - \vec{a}$ (D) $\vec{a} \cdot \vec{b}$

4- Minimum value of the function $f(x) = x^2 + 2x - 3$ is at $x =$

(A) –3 (B) 1 (C) 0 (D) –1

5- The range of $f(x) = x^2$ is

(A) $(-\infty, 0)$ (B) $(-\infty, \infty)$ (C) $(-1, 0)$ (D) $(0, \infty)$

6- $\left|\cos\alpha\,\underline{i} + \sin\alpha\,\underline{j} + 0\underline{k}\right| =$

(A) 0 (B) –1 (C) 2 (D) 1

7- The length of tangent from (0, 1) to the circle $x^2 + y^2 + 6x - 3y + 3 = 0$ is

(A) 2 (B) 3 (C) 4 (D) 1

8- (1, –3) is in the solution of region

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

9- $\frac{d}{dx}(\sinh 2x) =$

(A) 2 cosh 2x (B) 2 sinh 2x (C) –2 cosh 2x (D) –2 sinh 2x

10- Centre of the circle $5x^2 + 5y^2 + 14x + 12y - 10 = 0$ is

(A) $\left(\frac{-7}{5}, \frac{-6}{5}\right)$ (B) $\left(\frac{7}{5}, \frac{6}{5}\right)$ (C) (7, 6) (D) (7, –6)

(Turn over)

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11- If $f(x) = \cos x$, then $f^2\left(\frac{\pi}{2}\right) =$

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

12- Anti derivative of $\cot x =$

(A) $\ell n \cos x + c$ (B) $\ell n \sin x + c$ (C) $-\ell n \cos x + c$ (D) $-\ell n \sin x + c$

13- $\frac{d}{dx}(\cos^{-1} 3x) =$

(A) $\frac{3}{\sqrt{1-9x^2}}$ (B) $\frac{-3}{\sqrt{1-9x^2}}$ (C) $\frac{1}{\sqrt{1-9x^2}}$ (D) $\frac{-1}{\sqrt{1-9x^2}}$

14- Focus of parabola $x^2 = -16y$ is

(A) $(0, -4)$ (B) $(0, 4)$ (C) $(4, 0)$ (D) $(-4, 0)$

15- $\int_{-1}^{0} \frac{1}{1+x^2}\, dx =$

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

16- Centroid of triangle with vertices A(2, 1), B(–1, 3) and C(–1, –4) is

(A) (3, 1) (B) (0, 0) (C) (2, 2) (D) (–2, –5)

17- $\int e^{\tan x} \sec^2 x\, dx =$

(A) $-e^{\tan x} + c$ (B) $e^{\tan x} + c$ (C) $e^{\tan^2 x} + c$ (D) $e^{\cos x} + c$

18- Distance between (1, 2) and (2, 1) is

(A) $\sqrt{3}$ (B) $\sqrt{5}$ (C) $\sqrt{2}$ (D) 7

19- Equation of a straight line passing through P(–2, 3) and parallel to x-axis is

(A) $x = -2$ (B) $y = 3$ (C) $x = 3$ (D) $y = -2$

20- $\frac{d}{dx}\left(\frac{1}{x^2}\right)$ at $x = 1$ is

(A) –2 (B) 2 (C) 1 (D) –1

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Mathematics **(INTER PART II)-419** **PAPER: II** **GROUP: I**
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- Determine whether $f(x) = x\sqrt{x^2+5}$ is even or odd.

ii- For the real valued function $f(x) = \frac{2x+1}{x-1}$ find $f^{-1}(x)$ and $f^{-1}(-1)$

iii- If $f(x) = \begin{cases} x-1, & x < 3 \\ 2x+1, & 3 \le x \end{cases}$ Find $\lim_{x \to 3^-} f(x)$ and $\lim_{x \to 3^+} f(x)$.

iv- Find the derivative of $f(x) = c$ by first principle.

v- Differentiate $y = \frac{a+x}{a-x}$ w.r.t, x

vi- Find $\frac{dy}{dx}$ if $y = e^{x^2+1}$

vii- Determine the values of x, for which $f(x) = x^2 + 2x - 3$ is extreme.

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

ix- If $y = \sin^{-1}\frac{x}{a}$ then $\frac{dy}{dx} = \frac{1}{\sqrt{a^2-x^2}}$

x- Define a stationary point.

xi- Define even function and give an example.

xii- Find $\frac{dy}{dx}$ if $y = \tanh(x^2)$.

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

i- Use differentials, find $\frac{dy}{dx}$ if $x^2 + 2y^2 = 4$

ii- Evaluate $\int \cos 3x \cdot \sin 2x \, dx$

iii- Evaluate $\int \frac{\sin\theta}{1+\cos^2\theta} \, d\theta$

iv- Integrate $\tan^{-1}x$ w. r. t 'x'

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

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

vii- Find area between x-axis and curve $y = 4x - x^2$

viii- Solve differential equation $xdy + y(x-1)\,dx = 0$

ix- Define order of differential equation.

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

xi- Define corner point.

xii- Graph the feasible region of $3x - 2y \ge 6$

(Turn over)

Guj - 12 - G1 - 19

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

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

ii- Define centroid of a triangle.

iii- Find an equation of line through A(–6, 5) and having slope 7.

iv- Convert into two intercept form $2x - 4y + 11 = 0$

v- Find centre and radius of circle $5x^2 + 5y^2 + 14x + 12y - 10 = 0$

vi- Determine whether the point P(–5,6) lies outside, on or inside the circle $x^2 + y^2 + 4x - 6y - 12 = 0$

vii- Write an equation of parabola with focus (–1, 0), vertex (–1, 2)

viii- Find an equation of ellipse with centre (0, 0), focus (0, –3) and vertex (0, 4)

ix- Define direction angles.

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

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

xii- Find a and b so that the vectors $3\underline{i} - \underline{j} + 4\underline{k}$ and $a\underline{i} + b\underline{j} - 2\underline{k}$ are parallel.

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

SECTION II

5- (a) Prove that $\lim_{n \to +\infty} \left(1 + \frac{1}{n}\right)^n = e$ **5**

(b) Apply the Maclaurin series expansion to prove $\ell n(1 + x) = x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + ...$ **5**

6- (a) Evaluate the integral $\int \frac{(a-b)x}{(x-a)(x-b)}\,dx$ **5**

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

7- (a) Find the integral $\int_0^{\sqrt{7}} \frac{3x}{\sqrt{x^2+9}}\,dx$ **5**

(b) Graph the feasible region of the inequalities and find the corner points: **5**

$$x + y \leq 5$$
$$-2x + y \geq 2$$
$$x \geq 0, \quad y \geq 0$$

8- (a) Show that the lines $4x - 3y - 8 = 0$; $3x - 4y - 6 = 0$; $x - y - 2 = 0$ are concurrent and third line bisect the angle formed by first two. **5**

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

9- (a) Find the equation of 'Ellipse' with vertices (-1, 1); (5, 1) and foci (4, 1) and (0, 1) **5**

(b) Using vectors, find the area of triangle ABC whose vertices are A(1, –1, 1); B(2, 1, –1) and C(–1, 1, 2) **5**

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Roll No. of Candidate : _____

Mathematics **(INTER PART II)-419-(IV)** **PAPER: II** **GROUP:II**

Time: 30 Minutes **Code: 8198** **Marks: 20**

OBJECTIVE

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. Attempt as many questions as given in objective type question paper and leave others blank.

1- 1- The centre of the circle $x^2 + y^2 - 6x + 4y + 13 = 0$ is

(A) (3, 2) (B) (3, –2) (C) (2, 3) (D) (–2, –3)

2- If α, β, γ be the direction angles of a vector then $\cos^2\alpha + \cos^2\beta + \cos^2\gamma =$

(A) 2 (B) 0 (C) –1 (D) 1

3- The perpendicular distance of the line $12x + 5y = 7$ from the origin is

(A) $\frac{7}{13}$ (B) $\frac{13}{7}$ (C) 13 (D) $\frac{1}{13}$

4- $\int \tan^2 x\,dx$ is equal to

(A) $\tan x + x + c$ (B) $\tan x - x + c$ (C) $2\tan x + c$ (D) $2\tan x + x + c$

5- $\int \cot x\,dx =$

(A) $\text{cosec}^2 x + c$ (B) $-\text{cosec}^2 x + c$ (C) $\ell n \sin x + c$ (D) $\ell n \cos x + c$

6- If $y = \frac{1}{x^2}$ then $\frac{dy}{dx}$ at $x = -1$

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

7- If $f(x) = \frac{1}{x^2}$ $(x \neq 0)$, then $fof(x)$ is

(A) x^4 (B) x^2 (C) 1 (D) $\frac{1}{x^4}$

8- Angle between the vectors $4\underline{i} + 2\underline{j} - \underline{k}$ and $-\underline{i} + \underline{j} - 2\underline{k}$ is

(A) 30° (B) 45° (C) 90° (D) 60°

9- (1, 0) is the solution of the inequality

(A) $7x + 2y < 8$ (B) $x - 3y < 0$ (C) $10x + 5y < 6$ (D) $-3x + 5y > 2$

10- $\frac{d}{dx}(\ell n\, 2x) =$

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

(Turn over)

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11- $\int_0^{\pi} \sec x \tan x \, dx =$

(A) 0 (B) 1 (C) –1 (D) –2

12- Eccentricity of an ellipse is

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

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

(A) 0 (B) 1 (C) 2 (D) 3

14- $\lim_{n \to \infty} \left(1 + \frac{1}{n}\right)^{2n} =$

(A) e (B) e^2 (C) e^n (D) zero

15- The vertices of a triangle are (a, b – c), (b, c – a), (c, a – b) then its centroid is

(A) $\left(0, \frac{a+b+c}{3}\right)$ (B) $\left(0, \frac{a-b-c}{3}\right)$ (C) (0, 0) (D) $\left(\frac{a+b+c}{3}, 0\right)$

16- If $f'(c) = 0$ then $f(x)$ has relative maximum value at $x = c$ if

(A) $f''(c) < 0$ (B) $f''(c) > 0$ (C) $f''(c) = 0$ (D) $f'''(c) = 0$

17- The point of concurrency of altitudes of a triangle is called

(A) centroid (B) orthocentre (C) in centre (D) circum centre

18- Slope of the line $2x + y - 3 = 0$ is

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

19- $y = \sin 3x$ then y_2 is

(A) $9 \cos x$ (B) $-9 \sin 3x$ (C) $9 \sin 3x$ (D) $-9 \cos 3x$

20- Axis of parabola $x^2 = 4ay$ is

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

Guj - 12 - GL - 19

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- Define implicit function.

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

iii- Evaluate $\lim_{x \to -1} \frac{x^3 - x}{x+1}$ by using algebraic technique.

iv- Find $\frac{dy}{dx}$ if $y = (x-5)(3-x)$

v- Find $\frac{dy}{dx}$ if $xy + y^2 = 2$

vi- Differentiate $\sin x$ w. r. t. $\cot x$

vii- Find $\frac{dy}{dx}$ if $y = \frac{x}{\ell n x}$

viii- Define the stationary point.

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

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

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

xii- Find the extreme values for $f(x) = 5x^2 - 6x + 2$

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

i- Using differentials find $\frac{dx}{dy}$ if $x^2 + 2y^2 = 16$

ii- Define first order differential equation.

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

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

v- Evaluate $\int \sin^{-1} x \, dx$

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

vii- Evaluate $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \cos t \, dt$

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

ix- Solve the differential equation $\frac{x^2+1}{y+1} = \frac{x}{y}\frac{dy}{dx}$ $(x, y > 0)$

x- Evaluate $\int x^2 \ell n x \, dx$

xi- Define problem constraints.

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

(Turn over)

Guj - 12 - G2 - 19

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

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

ii- A point P(5, 3) is in xy-coordinates system. Axes are rotated through angle 45°. Find the new point P(X, Y)

iii- Find an equation of line passing through (2, 3), having slope –1.

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

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

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

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

viii- Find the centre and eccentricity of the ellipse $\frac{(2x-1)^2}{16} + \frac{(y+2)^2}{16} = 1$

ix- Define scalar product of two vectors.

x- Find a vector of length 5 in the direction opposite to that of $\underline{v} = \hat{i} - 2\hat{j} + 3\hat{k}$

xi- Find a vector perpendicular to the plane containing vectors $\underline{a} = 2\hat{i} - 6\hat{j} - 3\hat{k}$, $\underline{b} = 4\hat{i} + 3\hat{j} - \hat{k}$

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

xiii- What are direction angles of a vector?

SECTION II

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(x) is continuous at x = 2 **5**

(b) Find $\frac{dy}{dx}$ if $y = \frac{\sqrt{a+x} + \sqrt{a-x}}{\sqrt{a+x} - \sqrt{a-x}}$, $x \neq 0$ **5**

6- (a) Evaluate $\int \frac{1+4x}{(x-3)(x^2+4)}\,dx$ **5**

(b) If (4, –2), (–2, 4) and (5, 5) are vertices of a triangle, find the co-ordinates of its 'Incentre'. **5**

7- (a) Evaluate $\int_0^{\frac{\pi}{4}} \frac{\cos\theta + \sin\theta}{2\cos^2\theta}\,d\theta$ **5**

(b) Graph the solution region and find the corner points of **5**

$3x + 2y \geq 6$; $x + y \leq 4$; $x \geq 0$, $y \geq 0$

8- (a) Show that the line $2x + 3y - 13 = 0$ is tangent to the circle $x^2 + y^2 + 6x - 4y = 0$ **5**

(b) Prove that the angle in a semi-circle is a right angle. **5**

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

(b) Find the volume of the tetrahydron whose vertices are A(2, 1, 8), B(3, 2, 9), C(2, 1, 4), D(3, 3, 10) **5**

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