Roll No. of Candidate _____

Mathematics | **(INTERMEDIATE PART II)-421-(II)** | **GROUP: I**

Time: 30 Minutes | **OBJECTIVE** | **PAPER: II**

Code: 8193 GUJ-41-21 | **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. Attempt as many questions as given in objective type question paper and leave others blank.

1- 1- Length of vector $2\underline{i} - \underline{j} - 2\underline{k}$ is

(A) 2 (B) 4 (C) 3 (D) 5

2- The unit vector along y–axis is

(A) $\underline{i}$ (B) $\underline{j}$ (C) $\underline{k}$ (D) 1

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

(A) (0,4) (B) (4, 0) (C) (0, –4) (D) (–4, 0)

4- If $a > b$, then

(A) $-a < b$ (B) $-a < -b$ (C) $a < -b$ (D) $a > b$

5- The point of intersection of lines $x + y = 2$ and $2x - y = 1$ is

(A) (1, 2) (B) (–1, 2) (C) (–1, –2) (D) (1,1)

6- Order of differential equation $y\frac{dy}{dx} + 2x = 0$ is

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

7- $\int \tan\frac{\pi}{4}\,dx$ is

(A) $\ell n \sin\frac{\pi}{4}$ (B) x (C) $\sec^2\frac{\pi}{4}$ (D) $\frac{x}{4}$

8- $\frac{d^2}{dx^2}(2^x)$ is

(A) $x\,2^{x-1}$ (B) $\ell n\, 2^x$ (C) $2^x(\ell n\, 2)^2$ (D) $x\,\ell n\, 2$

9- $\frac{d}{dx}(\sec^{-1} x + \text{cosec}^{-1} x)$ equals

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

10- $\lim_{x \to \pi} \frac{\sin x}{\pi - x}$ equals

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

(Turn over)

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11- Derivative of $\cot x$ w.r.t. x is

(A) $-\text{cosec}^2 x$ (B) $\sec^2 x$ (C) $+\text{cosec}^2 x$ (D) $-\sec^2 x$

12- $(\underline{i} \times \underline{j}) \times \underline{k}$ equals

(A) -1 (B) 1 (C) zero (D) 2

13- $\int_0^1 \frac{1}{1+x^2}\, dx$ equals

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

14- Directrices of $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ are

(A) $x = \pm\frac{c}{e^2}$ (B) $y = \pm\frac{c}{e^2}$ (C) $x = \pm\frac{c}{e}$ (D) $\pm\frac{e^2}{c}$

15- The lines ℓ_1, ℓ_2 with slopes m_1, m_2 are perpendicular if

(A) $m_1 m_2 = 1$ (B) $m_1 = m_2$ (C) $m_1 m_2 = -1$ (D) $m_1 + m_2 = 0$

16- Differential of y is

(A) dy' (B) $\frac{dy}{dx}$ (C) dy (D) dx

17- $\frac{d}{dx}(\cos\sqrt{x})$

(A) $\frac{-\sin\sqrt{x}}{\sqrt{x}}$ (B) $-\sin\sqrt{x}$ (C) $\frac{-\sin\sqrt{x}}{2\sqrt{x}}$ (D) $\frac{\cos\sqrt{x}}{\sqrt{x}}$

18- Function $F(x) = \frac{3x}{x^2+1}$ is called

(A) even function (B) odd function (C) constant function (D) linear function

19- Slope of line parallel to x-axis is

(A) -1 (B) zero (C) 1 (D) 2

20- Length of diameter of circle $x^2 + y^2 = 9$ is

(A) 6 (B) 3 (C) 9 (D) 4

Mathematics **(INTER PART II)-421** **GROUP: I**
Time: 2:30 hours **PAPER: II**
Marks: 80

SUBJECTIVE GUJ-G1-21

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- Show that the parametric equations $x = at^2$, $y = 2at$ represent the equation of parabola $y^2 = 4ax$

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

iii- Evaluate $\lim_{x \to 3} \frac{x-3}{\sqrt{x}-\sqrt{3}}$

iv- Evaluate $\lim_{x \to 0} \frac{1-\cos x}{\sin^2 x}$

v- Find the derivative of $\sqrt{x}$ at $x = a$ from first principle.

vi- Differentiate $\frac{2x-3}{2x+1}$ w. r. t. 'x'.

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

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

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

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

xi- Find y_2 if $y = x^2 . e^{-x}$

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

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

i- Using differentials find $\frac{dy}{dx}$ and $\frac{dx}{dy}$ for $xy + x = 4$

ii- Integrate $\frac{1}{\sqrt{x+a}+\sqrt{x}}$ w.r.t x

iii- Solve $\int$ cosec x dx

iv- Evaluate $\int \frac{ax}{\sqrt{a^2-x^4}}\, dx$

v- Solve $\int e^{ax}\left[a \sec^{-1}x + \frac{1}{x\sqrt{x^2-1}}\right] dx$

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

vii- Solve $\frac{x^2+1}{y+1} = \frac{x}{y}\frac{dy}{dx}$

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

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

x- Find the equation of line with slope: –5 and y-intercept is –7

xi- Show that the points (–1, –3), (1, 5) and (2,9) lie on the same straight line.

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

i- Graph the solution set of linear inequality in xy-plane, $3x - 2y \geq 6$

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

iii- Find the focus and vertex of the parabola $x^2 - 4x - 8y + 4 = 0$

iv- Write an equation of parabola with axis $y = 0$, through $(2,1)$ and $(11,2)$

v- Find the coordinate of vertices of a hyperbola $\frac{y^2}{16} - \frac{x^2}{49} = 1$

vi- Find the foci of the hyperbola $\frac{x^2}{4} - \frac{y^2}{9} = 1$

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

viii- Find a unit vector in the direction of $\underline{v} = \frac{1}{2}\underline{i} + \frac{\sqrt{3}}{2}\underline{j}$

ix- Let $\underline{v} = 3\underline{i} - 2\underline{j} + 2\underline{k}$, $\underline{w} = 5\underline{i} - \underline{j} + 3\underline{k}$ find $\underline{v} - 3\underline{w}$

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

xi- Find the direction cosines of $\overrightarrow{PQ}$ where P = (2, 1, 5), Q = (1, 3, 1)

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

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

SECTION II

5- (a) Evaluate limit by using algebraic techniques: $\lim_{x \to a} \frac{x^n - a^n}{x^m - a^m}$ **5**

(b) Find $\frac{dy}{dx}$ of the given parametric functions: $x = \frac{a(1-t^2)}{1+t^2}$; $y = \frac{2bt}{1+t^2}$ **5**

6- (a) Show that $\int \sqrt{a^2 - x^2}\, dx = \frac{a^2}{2}\sin^{-1}\frac{x}{a} + \frac{x}{2}\sqrt{a^2 - x^2} + c$ **5**

(b) Find the area of the region bounded by the triangle whose sides are **5**

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

7- (a) Solve the given differential equation: $\frac{1}{x}\frac{dy}{dx} = \frac{1}{2}(1 + y^2)$ **5**

(b) Maximize $f(x, y) = 2x + 5y$ subject to the constraints **5**

$2y - x \leq 8$, $x - y \leq 4$; $x \geq 0$, $y \geq 0$

8- (a) Find the centre and radius of the circle $4x^2 + 4y^2 - 8x + 12y - 25 = 0$ **5**

(b) If $\underline{a} + \underline{b} + \underline{c} = 0$, then prove that $\underline{a} \times \underline{b} = \underline{b} \times \underline{c} = \underline{c} \times \underline{a}$ **5**

9- (a) Show that $y = \frac{\ell n\, x}{x}$ has maximum value at $x = e$ **5**

(b) Find the centre, foci and vertices of equation $9x^2 - y^2 - 36x - 6y + 18 = 0$ **5**