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 $\frac{x\,d^2y}{dx^2} + \frac{dy}{dx} + 2x = 0$ 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) $x = -y$

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Mathematics (INTER PART II)-419 PAPER: II GROUP:II
Time: 2:30 hours Marks: 80

SUBJECTIVE

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

SECTION I

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

i- 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)

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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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