

Roll No _____ (To be filled in by the candidate)

(Academic Sessions 2020 – 2022 to 2022 – 2024)

MATHEMATICS 224-1st Annual-(INTER PART – II) Time Allowed : 30 Minutes

Q.PAPER – IL(Objective Type)

GROUP – II

Maximum Marks : 20

PAPER CODE = 8192

LHR-2-24

Note : Four possible answers A, B, C and D to each question are given. The choice which you think is correct, fill that circle in front of that question with Marker or Pen ink in the answer-book. Cutting or filling two or more circles will result in zero mark in that question.

1-1	If $f(x) = \frac{1}{x^2}$ when which of the following is equal to $f \circ f(x)$:		
(A) x^4	(B) x^2	(C) 1	(D) $\frac{1}{x^4}$
2	What is the value of $\lim_{x \rightarrow 0} (x \sin x)$:		
(A) α	(B) -1	(C) 1	(D) 0
3	What is the value of $\sqrt{1-x^2} \frac{d}{dx} (\sin^{-1} x + \cos^{-1} x)$:		
(A) $\sqrt{1-x^2}$	(B) 0	(C) 2	(D) $\frac{1}{x}$
4	$\frac{d}{dx} (\sin^{-1} x) = :$		
(A) $\frac{1}{\sqrt{1-x^2}}$	(B) $\frac{-1}{\sqrt{1-x^2}}$	(C) $\frac{1}{\sqrt{1+x^2}}$	(D) $\frac{-1}{\sqrt{1+x^2}}$
5	Derivative of x^3 w.r.t x^3 is :		
(A) 0	(B) 1	(C) x^3	(D) $3x^2$
6	If $f(x) = a^x$ then $f'(x) = :$		
(A) $a^x \ln a$	(B) $a^x \ln x$	(C) $a^x (\ln a)^2$	(D) $(a^x)^2 \ln a$
7	$\int x^{-1} dx :$		
(A) 0	(B) $-x^{-2} + c$	(C) ∞	(D) $\ln x + c$
8	$\int_0^1 \frac{1}{\sqrt{1-x^2}} dx = :$		
(A) $\frac{\pi}{6}$	(B) $\frac{\pi}{4}$	(C) $\frac{\pi}{3}$	(D) $\frac{\pi}{2}$
9	$\int \tan x dx = :$		
(A) $\ln \cot x + c$	(B) $\ln \sec x + c$	(C) $\ln \sin x + c$	(D) $\ln \csc x + c$

(Turn Over)

(2)

1.10	$\int_0^{\pi} \sin x \, dx = :$ (A) 0 (B) 1 (C) 2 (D) π
11	A linear equation in two variables represents : (A) Circle (B) Ellipse (C) Hyperbola (D) Straight line
12	Intercept form of equation of line is : (A) $\frac{x}{a} + \frac{y}{b} = 1$ (B) $\frac{x}{a} + \frac{y}{b} = 0$ (C) $\frac{x}{a} - \frac{y}{b} = 1$ (D) $\frac{x}{a} - \frac{y}{b} = 0$
13	Distance of point $(\cos 3x, \sin 3x)$ from origin is : (A) 3 (B) 6 (C) 9 (D) 1
14	$(0, 0)$ is one of the solution of inequality : (A) $3x + 5y > 4$ (B) $2x + 3y < 4$ (C) $x + 3y > 5$ (D) $2x + 3y > 5$
15	Equation of circle with centre $(3, 0)$ and radius $\sqrt{9}$ is : (A) $x^2 + y^2 - 6x = 0$ (B) $x^2 - 6x = 9$ (C) $x^2 + y^2 = 9$ (D) $9x^2 + y^2 = 9$
16	Equation of directrix of parabola $y^2 = -12x$ is : (A) $x = -3$ (B) $x = 3$ (C) $y = 3$ (D) $y = -3$
17	Co-vertices of ellipse $\frac{x^2}{b^2} + \frac{y^2}{a^2} = 1; a > b$ are : (A) $(\pm a, 0)$ (B) $(0, \pm a)$ (C) $(0, \pm b)$ (D) $(\pm b, 0)$
18	Which of the following vectors is equal to the vector $\underline{i} \cdot \underline{j} \times \underline{k}$: (A) 0 (B) 1 (C) -1 (D) $\underline{i}$
19	For what value of P $[2 \ P \ 5]$ is perpendicular to $[3 \ 1 \ P]$: (A) $\frac{2}{3}$ (B) -1 (C) 1 (D) $\sqrt{5}$
20	If $\underline{a}$ and $\underline{b}$ are parallel vectors then $\underline{a} \times \underline{b} = :$ (A) 0 (B) 1 (C) -1 (D) 2

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(Academic Sessions 2020 – 2022 to 2022 – 2024)

MATHEMATICS

224-1st Annual-(INTER PART – II)

Time Allowed : 2.30 hours

PAPER – II (Essay Type)

GROUP – II

Maximum Marks : 80

SECTION – I

LHR-2-24

2. Write short answers to any EIGHT (8) questions :

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- (i) Given that $f(x) = \cos x$ find $\frac{f(a+h) - f(a)}{h}$ and simplify.
- (ii) If $f(x) = (-x+9)^3$, find $f^{-1}(x)$
- (iii) By rationalizing, find $\lim_{x \rightarrow 0} \frac{\sqrt{x+a} - \sqrt{a}}{x}$
- (iv) Write down the domain and range of $f(x) = 2x - 5$
- (v) Calculate derivative of $f(x) = x^{\frac{2}{3}}$ at $x = 8$
- (vi) Find derivative of $\frac{1+x}{1-x}$ w.r.t. x
- (vii) If $y = x^4 + 2x^2 + 2$, find $\frac{dy}{dx}$
- (viii) Find $\frac{dy}{dx}$ of implicit function $x^2 - 4xy - 5y = 0$
- (ix) Apply chain rule to find $\frac{dy}{du}$ if $y = x^2 + \frac{1}{x^2}$ and $u = x - \frac{1}{x}$
- (x) Differentiate $\sin^2 x$ w.r.t $\cos^4 x$
- (xi) Find $f'(x)$ if $f(x) = x^3 e^{\frac{1}{x}}$
- (xii) Find y_2 if $y = x^2 \cdot e^{-x}$

3. Write short answers to any EIGHT (8) questions :

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- (i) Using differential to find $\frac{dx}{dy}$ of $x^4 + y^2 = xy^2$
- (ii) Evaluate $\int (2x+3)^2 dx$
- (iii) Evaluate $\int x\sqrt{x-a} dx$
- (iv) Evaluate $\int (\ln x)^2 dx$
- (v) Evaluate $\int_1^2 \left(x + \frac{1}{x}\right)^{\frac{1}{2}} \left(1 - \frac{1}{x^2}\right) dx$
- (vi) Find the area bounded by cos function from $x = -\frac{\pi}{2}$ to $x = \frac{\pi}{2}$
- (vii) Solve $\frac{dy}{dx} + \frac{2xy}{2y+1} = x$
- (viii) Find the mid-points of the line joining the two points $A(-8, 3)$, $B(2, -1)$.
- (ix) Find h such that the points $A(-1, h)$, $B(3, 2)$ and $C(7, 3)$ are collinear.
- (x) In the triangle $A(8, 6)$, $B(-4, 2)$, $C(-2, -6)$, find the slope of altitude of triangle.
- (xi) Using slopes, show that the triangle with vertices $A(6, 1)$, $B(2, 7)$, $C(-6, -7)$ is a right triangle.
- (xii) Find the point of intersection of the lines $x + 4y - 12 = 0$
 $x - 3y + 3 = 0$

(Turn Over)

4. Write short answers to any NINE (9) questions :

- (i) Define feasible region.
- (ii) Graph the solution set of $5x - 4y \leq 20$
- (iii) Write the standard and general equation of circle.
- (iv) Find centre and radius of $5x^2 + 5y^2 + 24x + 36y + 10 = 0$
- (v) Check the position of the point $(5, 6)$ with respect to the circle $x^2 + y^2 = 81$
- (vi) Find the length of the tangent drawn from the point $(-5, 4)$ to the circle $5x^2 + 5y^2 - 10x + 15y - 131 = 0$
- (vii) Find foci and eccentricity of ellipse $x^2 + 4y^2 = 16$
- (viii) Find the points of intersection of $x^2 + y^2 = 8$ and $x^2 - y^2 = 1$
- (ix) If $\underline{u} = 2\underline{i} - 7\underline{j}$, $\underline{v} = \underline{i} - 6\underline{j}$ and $\underline{w} = -\underline{i} + \underline{j}$, find $\frac{1}{2}\underline{u} + \frac{1}{2}\underline{v} + \frac{1}{2}\underline{w}$
- (x) Find a vector whose magnitude is 4 and is parallel to $2\underline{i} - 3\underline{j} + 6\underline{k}$
- (xi) Find α so that the vector $\underline{u}$ and $\underline{v}$ are perpendicular; $\underline{u} = \alpha\underline{i} + 2\alpha\underline{j} - \underline{k}$ and $\underline{v} = \underline{i} + \alpha\underline{j} + 3\underline{k}$
- (xii) Find the area of parallelogram whose vertices are A $(1, 2, -1)$; B $(4, 2, -3)$; C $(6, -5, 2)$; D $(9, -5, 0)$
- (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

Note : Attempt any THREE questions.

5. (a) Evaluate $\lim_{x \rightarrow 0} \frac{\sec x - \cos x}{x}$ 5
- (b) Find the derivative w.r.t. x $\sin \sqrt{\frac{1+2x}{1+x}}$ 5
6. (a) If $y = (\cos^{-1} x)^2$, prove that $(1-x^2)y_2 - xy_1 - 2 = 0$ 5
- (b) Evaluate $\int \frac{2x}{1-\sin x} dx$ 5
7. (a) Find the area between the x-axis and the curve $y = \sqrt{2ax - x^2}$ when $a > 0$ 5
- (b) Maximize $f(x, y) = 2x + 5y$ subject to the constraints $2y - x \leq 8$; $x - y \leq 4$, $x \geq 0$, $y \geq 0$ 5
8. (a) Find equation of the circle passing through the points A $(3, -1)$, B $(0, 1)$ and having centre at $4x - 3y - 3 = 0$ 5
- (b) Use vectors to prove that $\sin(\alpha - \beta) = \sin \alpha \cos \beta - \cos \alpha \sin \beta$ 5
9. (a) Mid-points of sides of triangle are $(1, -1)$, $(-4, -3)$ and $(-1, 1)$. Find coordinates of vertices of triangle. 5
- (b) Show that equation of parabola with focus at $(a \cos \alpha, a \sin \alpha)$ and directrix $x \cos \alpha + y \sin \alpha + a = 0$ is $(x \sin \alpha - y \cos \alpha)^2 = 4a(x \cos \alpha + y \sin \alpha)$ 5