

Q1. Choose the correct option i.e. A, B, C, or D.

- The correct value of the limit, $\lim_{x \rightarrow 0} \frac{1 - \cos x}{x}$ is:
 (A) Does not exist (B) $\frac{1}{12}$ (C) $\frac{1}{10}$ (D) $\frac{1}{14}$
- The most general anti-derivative of $f(x) = \cot x$ is:
 (A) $\ln \left| \frac{1}{\sin x} \right| + C$ (B) $\ln |\sin x| + C$ (C) $\csc x + C$ (D) $\tan^2 x + C$
- The correct value of $\int (e^x + x) dx$ is:
 (A) $\left(\frac{e^x}{x} + x \right) + C$ (B) $\left(\frac{e^x + x}{x} \right) + C$ (C) $(e^x + x)x + C$ (D) $e^x + C$
- The 3rd derivative of $f(x) = 3x^3$
 (A) $90x^4$ (B) $360x^3$ (C) $360x^2$ (D) $360x^4$
- If $F(x)$ is an anti-derivative of $f(x) = \cos x$, and $F(0) = 3$, then
 (A) $F(x) = \sin x + 3$ (B) $F(x) = -\sin x + 3$ (C) $F(x) = \cos x + 3$ (D) $F(x) = -\cos x + 3$
- Derivative of $y = \csc x$ is:
 (A) $\tan x \sec x$ (B) $\cos x \sec x$ (C) $-\cot x \csc x$ (D) $-\cot x \cos x$
- If $f(t) = \frac{1}{2}t + \sin t + \sqrt{t}$ is a vector function, then
 (A) 2 (B) 4 (C) 6 (D) 8
- To evaluate the integral $\int \sin x \cos^2 x dx$, the con-
 (A) $u = \sin x$ (B) $u = \cos x$ (C) $u = \cos^2 x$ (D) $u = x$
- The average rate of change of the linear function $f(x) =$
 (A) 1 (B) 3 (C) 7 (D) 8
- If $f(x) = \sqrt{3x+5}$ then $f'(0) =$
 (A) 0 (B) $\frac{1}{4}$ (C) $\frac{1}{2}$ (D) $\frac{3}{4}$
- For the line $y = -x + 6$, the point (5, 5) lies
 (A) Above the line (B) Below the line (C) On the line (D) It is the y-intercept
- The ODE $\frac{dy}{dx} + x \left(\frac{dy}{dx} \right)^2 + y = 0$ is:
 (A) Linear, Second Order (B) Non-linear, Second Order (C) Linear, First Order (D) Non-linear, First Order
- For $f(x) = x^2 - 5$ on the interval $[2, 3]$, the updated interval after the first iteration of the Bisection Method is
 (A) $[2, 2.5]$ (B) $[2.5, 3]$ (C) $[2, 1.5]$ (D) $[1.5, 3]$
- The coordinates of the foci of the ellipse $\frac{x^2}{9} + \frac{y^2}{16} = 1$ are:
 (A) $(\pm 3, 0)$ (B) $(0, \pm 3)$ (C) $(\pm 7, 0)$ (D) $(\pm 4, 0)$
- If $f(x, y) = 6xy(2x^2 + y^2)^2$, then the value of $f_x(1, 1)$ is:
 (A) $6y(2x^2 + y^2)^2$ (B) $12y(2x^2 + y^2)^2$ (C) $12x(2x^2 + y^2)^2$ (D) $6x(2x^2 + y^2)^2$
- The line representing the axis of the parabola $y^2 = 12x$ is:
 (A) $y = -3$ (B) $y = 3$ (C) $x = -3$ (D) $x = 3$
- The order of the differential equation $\frac{d^2y}{dx^2} + 3x \left(\frac{dy}{dx} \right)^3 = x^2$ is:
 (A) 1 (B) 2 (C) 3 (D) 4
- If a root has multiplicity $m > 1$, the convergence of the Newton-Raphson method becomes:
 (A) Faster (B) Divergent (C) Linear (D) Remains Quadratic
- The center of the circle having equation $(x - 5)^2 + y^2 = 25$ is:
 (A) (5, 5) (B) (5, 0) (C) (0, 5) (D) (-5, 0)
- The correct equation for a vertical line passing through the point (5, 0) is:
 (A) $y = -5$ (B) $y = 0$ (C) $x = 5$ (D) $x = -5$

Total Time: 2:40 Hours

Total Marks: 80

Marks: 50

EXM-12th-(M-1-2026)

Mathematics (12th)

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"Section-B"

Q.2. Attempt any TEN (10) parts of the following. All parts carry equal marks.

- (i) Evaluate the limit of $\lim_{x \rightarrow 4} \frac{x^2 - 16}{x - 4}$
- (ii) Find derivative of the implicit function $e^y + xy = e$
- (iii) Find equation of the tangent line to the curve $y = x^2 e^x$ at $x = -$
- (iv) Find the vector derivative of $F(x) = \sin^2 x i + e^{x^2} j + \sqrt{2x+1} k$
- (v) Evaluate the integral and check the result through differ
- (vi) Evaluate the integral $\int \frac{\ln x}{x^2} dx$
- (vii) Find the angle from the line $2x - y + 1 = 0$ to the line $5 = 0$
- (viii) Find equation of a line if the x -intercept is -1 and the line are $x: (-1, 0)$ and $y: (0, 6)$
- (ix) Find the center and radius of the Circle $3x^2 + 2y - 21 = 0$
- (x) Find equation of Tangent and Normal to the ellipse $2x^2 + 3y^2 = 35$
- (xi) Translate to parallel axes through the origin $16x^2 + 9y^2 - 64x + 54y + 1 = 0$
- (xii) Find the general solution of the differential equation $\frac{dy}{dx} = (x + y + 3)^2$
- (xiii) Perform two iterations of Bisection Method to approximate the actual root r of the function $f(x) = \ln x$ in the interval $[2, x]$

"Section-C"

Marks

Attempt

10 marks. All questions carry equal marks.

- Q.3. (a) Find the limit $\lim_{x \rightarrow 4} \frac{(x-1)^2}{x^2 + 3x}$
- (b) Find the value of $\cot^{-1}(\sqrt{x})$
- Q.4. Find the area under the curve $f(x) = \sin x$ from $x = 0$ to $x = \pi$ and the area under the curve $f(x) = \sin x$ from $x = 0$ to $x = \pi$ and the area under the curve $f(x) = \sin x$ from $x = 0$ to $x = \pi$
- Q.5. (a) Find the area of the region bounded by the line $x + 2y - 5 = 0$ touch the circle $x^2 + y^2 - 4x - 2y + 4 = 0$. Find also the center of the circle.
- (b) Find vertices, foci, eccentricity and the asymptotes of the hyperbola $x^2 - y^2 = 25$
- Q.6. (a) Use Euler's Theorem to verify that the function $f(x, y) = \sqrt{x^2 + y^2}$ is a homogeneous function. Find the degree.
- (b) Find the first three iterations of Newton-Raphson Method for the function $f(x) = x^3 - x - 1$ with $x_0 = 1$