

ESKPXII-XXVI (I)
MATHEMATICS PART-II

Time: 2 Hours 40 Minutes

SECTION "B"

Marks: 50

Q.2. Attempt any TEN (10) questions. All questions carry equal marks.

- i. Evaluate the limit of $\lim_{x \rightarrow 2} \frac{x^2 - 4}{x^2 - 3x + 2}$ 1+2+2
- ii. Find derivative of the implicit function $\sin y = x$ 1+2+2
- iii. Find the equation of tangent line to the curve $y = xe^{-x^2}$ at $x = 1$ 1+2+2
- iv. Find the vector derivative of $F(x) = \sqrt{x}i + \cos 3xj - (1 - x^2)k$ 1+2+2
- v. Evaluate the integral and check the result through differentiation $\int \frac{2x^2 + 7}{x^5} dx$ 1+2+2
- vi. Evaluate the integral $\int xe^{3x} dx$ 1+2+2
- vii. Find the angle from the line $x + y - 5 = 0$ to the line $x - y + 1 = 0$ 1+2+2
- viii. Find the equation of a line if the x - intercept and y - intercept of the line are $x: (-4, 0)$, and $y: (0, -5)$ 1+2+2
- ix. Find the center and radius of the circle $4x^2 + 4y^2 - 16x + 24y - 48 = 0$ 1+2+2
- x. Find equation of Tangent and Normal at a point $(0, 2)$ to the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$ 1+2+2
- xi. Translate to parallel axes through the point $(2, -1)$ the conic $4x^2 - y^2 - 16x - 2y + 11 = 0$. 1+2+2
- xii. Find the general solution of the non - linear differential equation $\frac{dy}{dx} = \tan^2(x + y)$. 1+2+2
- xiii. Perform two iteration of Bisection Method to approximate the actual root r of the function $f(x) = e^{-x} - x$ in the interval $[0, 1]$ 1+2+2

SECTION "C"

Marks: 30

Note: Attempt any THREE (03) questions from the following. Each question carries equal marks.

- Q.3. a) Determine the $\lim_{x \rightarrow \infty} \frac{7x - 2}{\sqrt{4x^2 + 1}}$ 1+2+2
b) Find derivative of $y = \cos^{-1}x$ 1+2+2
- Q.4. a) Find the area between the x - axis and the curve $f(x) = x^3$ from $x = -1$ to $x = 1$ 1+2+2
b) Find the point of intersection $P(x, y)$ of the pair of lines $x + y = 5$ & $2x - y = 4$ 1+2+2
- Q.5. a) Prove that the line $x - y + 5 = 0$ touch the circle $x^2 + y^2 - 2x - 4y - 3 = 0$. Find also the contact point. 1+2+2
b) Find vertices, foci, eccentricity and the asymptotes of the hyperbola $5y^2 - 20x^2 = 100$ 1+2+2
- Q.6. a) Use Euler's Theorem to verify the function $f(x, y) = \frac{1}{x^2 + y^2}$ is a homogenous function of degree -2. 1+2+2
b) Find iterate x_3 of Newton Raphson Method for the function $f(x) = \tan x - x$ with $x_0 = 4.5$ 1+2+2