INTERMEDIATE PART-II (12ᵗʰ CLASS)

MATHEMATICS   PAPER-II   TIME ALLOWED: 2.30 Hours

GROUP-I   **SUBJECTIVE**   MAXIMUM MARKS: 80

NOTE: - Write same question number and its part number on answer book, as given in the question paper.

SECTION-I

2.   **Attempt any eight parts.**   **8 × 2 = 16**

(i)   Express the perimeter P of square as a function of its area A.

(ii)   Evaluate $\displaystyle \lim_{x \to 1} \frac{x^2 - 1}{x^2 - x}$

(iii)   Evaluate $\displaystyle \lim_{\theta \to 0} \frac{1 - \cos\theta}{\sin\theta}$

(iv)   Find $\dfrac{dy}{dx}$ by 1ˢᵗ principle $\dfrac{1}{\sqrt{x + a}}$

(v)   Diff. w.r.t "x" $\dfrac{2x - 3}{2x + 1}$

(vi)   Find $\dfrac{dy}{dx}$ if $x^2 + y^2 - 4x = 5$

(vii)   Find $\dfrac{dy}{dx}$ if $x = \theta + \dfrac{1}{\theta}$ and $y = \theta + 1$

(viii)   Diff. w.r.t "x" :- $x^2 \sec 4x$

(ix)   Diff. $\ln\left(x^2 + 2x\right)$ w.r.t x

(x)   If $y = x\, e^{\sin x}$ then find $\dfrac{dy}{dx}$

(xi)   Find y_2 if $y = \ln\left(x^2 - 9\right)$

(xii)   Write Maclaurin's Series and Taylor's Series.

3.   **Attempt any eight parts.**   **8 × 2 = 16**

(i)   Evaluate $\displaystyle \int \frac{dx}{\sqrt{x + 1} - \sqrt{x}}$

(ii)   Find $\displaystyle \int \frac{1}{1 + \cos x}\, dx$

(iii)   Find $\displaystyle \int \ln x \cdot x^5\, dx$

(iv)   Find $\displaystyle \int \sec^4 x\, dx$

(v)   Evaluate $\displaystyle \int \frac{3x + 1}{x^2 - x + 6}\, dx$

(vi) $\displaystyle \int \left(\sqrt{x} + \frac{1}{\sqrt{x}}\right) dx$

(vii)   Find $\displaystyle \int x \cos x\, dx$

(viii) $\displaystyle \int_{1}^{2} \left(x^2 + 1\right) dx$

(ix)   Solve $y\, dx + x\, dy = 0$

(x)   Evaluate $\displaystyle \int_{-\pi}^{\pi} \sin x\, dx$

(xi)   Define a Convex Region.

(xii)   Graph the solution of linear inequality $2x + y \leq 6$

P.T.O.

4. **Attempt any nine parts.** $9 \times 2 = 18$

(i) Find the mid point of line segment joining the points $A\left(-\sqrt{5}, -\dfrac{1}{3}\right)$ and $B\left(-3\sqrt{5}, 5\right)$

(ii) Let $P(x, y) = (-6, 9)$ and axes are translated through $0'(-3. 2)$. Find X and Y.

(iii) Reduce $5x - 12y + 39 = 0$ into two intercepts form.

(iv) Find the point of intersection of lines $x - 2y + 1 = 0$ and $2x - y + 2 = 0$

(v) Find the angle between lines represented by $3x^2 + 7xy + 2y^2 = 0$

(vi) Write standard form of equation of circle.

(vii) Find the focus and vertex of $x^2 = -16y$

(viii) Find the equation of tangent to the circle $x^2 + y^2 = 25$ at point $(4, 3)$

(ix) Find the equation of ellipse with foci $(0, \pm 5)$ and eccentricity $= \dfrac{3}{5}$

(x) Find the vector from point A to origin where $\underline{AB} = 4\underline{i} - 2\underline{j}$ and $B = (-2, 5)$

(xi) Find direction cosines of $\underline{v} = \underline{i} - \underline{j} - \underline{k}$

(xii) Find projection of $\underline{a}$ along $\underline{b}$ where $\underline{a} = \underline{i} - \underline{k}$ and $\underline{b} = \underline{j} + \underline{k}$

(xiii) Find $\underline{u} \times \underline{v}$ when $\underline{u} = [2, -1, 1]$; $\underline{v} = [4, 2, -1]$

SECTION-II

NOTE: - **Attempt any three questions**. $3 \times 10 = 30$

5.(a) Given $f(x) = x^3 - ax^2 + bx + 1$ if $f(2) = -3$ and $f(-1) = 0$
find the values of a and b. 5

(b) Find by definition derivative w.r.t. x if $(x + 4)^{1/3}$ 5

6.(a) Evaluate $\int Co\sec^3 x \, dx$ 5

(b) Find the distance between the lines $x + 2y - 5 = 0$, $2x + 4y - 1 = 0$.
Also find an equation of the line lying midway between them. 5

7. (a) Evaluate $\displaystyle\int_0^{\pi/4} \dfrac{Cos\,\theta + Sin\,\theta}{1 + Cos\,2\theta} \, d\theta$ 5

(b) Maximize the function defined by $f(x, y) = 2x + 3y$ subject to the constraints
$2x + y \le 8$, $x + 2y \le 14$, $x \ge 0$, $y \ge 0$ 5

8. (a) Find an equation of the ellipse with Foci $(0, -1)$ and $(0, -5)$ and major axis of length 6. 5

(b) Prove that in any triangle ABC $a^2 = b^2 + c^2 - 2bc\,Cos\,A$ by vector method. 5

9.(a) Find an equation of the parabola having its focus at the origin and directrix parallel to
the $x -$ axis and below the $x -$ axis. 5

(b) Prove $Sin(\alpha - \beta) = Sin\,\alpha\,Cos\,\beta - Cos\,\alpha\,Sin\,\beta$ 5