2015 (A) Roll No: _____

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) $f(x) = -2x + 8$, then find $f^{-1}(x)$.

(iii) Evaluate $\lim\limits_{x \to 0} \dfrac{Sin\,7x}{x}$

(iv) Differentiate w.r.t. "x" $x^{-3} + 2x^{-3/2} + 3$

(v) Find $\dfrac{dy}{dx}$ if $xy + y^2 = 2$

(vi) Find $\dfrac{dy}{dx}$ if $y = \tan h(x^2)$

(vii) Find $f'(x)$ if $f(x) = e^{\sqrt{x}-1}$

(viii) Find y_2 if $y = (2x + 5)^{3/2}$

(ix) Find $\dfrac{dy}{dx}$ if $y = a^{\sqrt{x}}$

(x) Write the product rule in derivative.

(xi) Differentiate w.r.t. "x", $\dfrac{a + x}{a - x}$

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

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

(i) Use differential to find $\dfrac{dy}{dx}$ when $x^2 + 2y^2 = 16$

(ii) Evaluate $\int \dfrac{1}{\sqrt{x}\left(\sqrt{x}+1\right)}\,dx$ $(x > 0)$

(iii) Evaluate $\int \left(\sqrt{x} + 1\right)^2\,dx$

(iv) Evaluate $\int \dfrac{\left(1 + e^x\right)^3}{e^x}\,dx$

(v) Evaluate $\int Co\sec x\;dx$

(vi) Evaluate $\int \dfrac{x^2}{4 + x^2}\,dx$

(vii) Evaluate $\int_0^3 \dfrac{dx}{x^2 + 9}$

(viii) Find the area between the $x-$axis and the curve $y = Cos\dfrac{1}{2}x$ from $x = -\pi$ to π.

(ix) Solve the differential equation $\dfrac{dy}{dx} = -y$

(x) Evaluate $\int e^{-x}\left(Cos\,x - Sin\,x\right)dx$

(xi) Graph the solution set of linear inequality $5x - 4y \le 20$ in $xy-$plane.

(xii) Define Optimal Solution.

P.T.O.

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

(i) Find an equation of the perpendicular bisector of the segment joining the points $A(3, 5)$, $B(9, 8)$

(ii) Prove $ax + by + c = 0$ represents a straight line, where a, b and c are constants and a and b are not simultaneously zero.

(iii) Check whether the lines $4x - 3y - 8 = 0$, $3x - 4y - 6 = 0$ and $x - y - 2 = 0$ are concurrent, if so find the point of concurrency.

(iv) Find the lines represented by $9x^2 + 24xy + 16y^2 = 0$ also find the angle between them.

(v) Show that the points $A(0, 2)$, $B(\sqrt{3}, -1)$ and $C(0, -2)$ are vertices of a right triangle.

(vi) Find centre and radius of the circle $x^2 + y^2 - 6x + 4y + 13 = 0$.

(vii) Find the length of the tangent drawn from the point $(-5, 4)$ to the circle $5x^2 + 5y^2 - 10x + 15y - 131 = 0$

(viii) Prove the point of a parabola which is closest to the focus, is the vertex of the parabola.

(ix) Find foci and vertices of ellipse $4x^2 + 9y^2 = 36$

(x) Find α so that the vectors $2\underline{i} + \alpha\underline{j} + 5\underline{k}$ and $3\underline{i} + \underline{j} + \alpha\underline{k}$ are perpendicular.

(xi) A force $\vec{F} = 7\underline{i} + 4\underline{j} - 3\underline{k}$ is applied at $P(1, -2, 3)$. Find its moment about the point $Q(2, 1, 1)$

(xii) Find a vector whose magnitude is 4 and is parallel to $2\underline{i} - 3\underline{j} + 6\underline{k}$.

(xiii) Prove that $Cos^2\alpha + Cos^2\beta + Cos^2\gamma = 1$ where α, β, γ are direction angles.

SECTION-II

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

5.(a) Derive the formula $\lim\limits_{x \to 0} \dfrac{Sin\, x}{x} = 1$

(b) If $y = \left(Cos^{-1}x\right)^2$ prove that $(1 - x^2)y_2 - x\,y_1 - 2 = 0$

6.(a) Evaluate $\int \dfrac{Sin\, x + Cos^3 x}{Cos^2 x\, Sin\, x}\, dx$

(b) Find the area of the triangular region whose vertices are $A(5, 3)$, $B(-2, 2)$, $C(4, 2)$

7. (a) Solve the differential equation $2e^x \tan y\, dx + (1 - e^x)\, Sec^2 y\, dx = 0$

(b) Maximize $f(x, y) = x + 3y$ subject to the constraints $2x + 5y \le 30$, $5x + 4y \le 20$, $x \ge 0$, $y \ge 0$

8. (a) The tangent to a circle at any point of the circle is perpendicular to the radial segment at that point.

(b) Show that mid point of hypotenuse in a right triangle is equidistant from its vertices.

9.(a) Find focus, vertex and directrix of the parabola $(x - 1)^2 = 8(y + 2)$

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