2015 (A) Roll No: _____

INTERMEDIATE PART-II (12th CLASS)

MATHEMATICS PAPER-II TIME ALLOWED: 2.30 Hours

GROUP-II **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) Find the perimeter P of a square as a function of its area A.

(ii) Evaluate $\lim_{h \to 0} (1 - 2h)^{1/h}$.

(iii) Find $f^{-1}(x)$ when $f(x) = (-x + 9)^3$

(iv) Compute $\frac{dy}{dx}$ when $y = \left(\sqrt{x} - \frac{1}{\sqrt{x}}\right)^2$

(v) Find $\frac{dy}{dx}$ when $x^2 + y^2 - 4x = 5$

(vi) Differentiate $(Sin 2\theta - Cos 3\theta)^2$ w.r.t. θ.

(vii) Find the derivative of $\frac{1}{a} Sin^{-1}\left(\frac{a}{x}\right)$ w.r.t x.

(viii) Determine the derivative of $\log_{10}(ax^2 + bx + c)$ w.r.t x.

(ix) Find $\frac{dy}{dx}$ when $y = \frac{e^x}{e^{-x} + 1}$

(x) If $y = Sin 3x$, find y_2.

(xi) Using Taylor's series, expand $Cos(x + h)$ upto two terms.

(xii) Define Critical Value of $f(x)$.

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

(i) Find δy and dy for the function defined as $y = \sqrt{x}$ when x changes from 4 to 4.41.

(ii) Evaluate $\int \frac{1}{\sqrt{x}(\sqrt{x} + 1)} dx$

(iii) Evaluate $\int \frac{1 - x^2}{1 + x^2} dx$

(iv) Find $\int Co\sec x \, dx$

(v) Evaluate $\int x \, e^x \, dx$

(vi) Evaluate $\int e^{ax} \left[a \, Sec^{-1} x + \frac{1}{x\sqrt{x^2 - 1}} \right] dx$

(vii) Evaluate $\int_0^{\frac{\pi}{4}} Sec x (Sec x + \tan x) \, dx$

(viii) Evaluate $\int_1^2 \ell n x \, dx$

(ix) Find the area below the curve $y = 3\sqrt{x}$ and above the $x-$axis between $x = 1$ to $x = 4$

(x) Define order of the differential equation with one example.

(xi) What is an Objective Function?

(xii) Graph the solution set of the linear inequality in $xy-$plane:- $5x - 4y \leq 20$

P.T.O.

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

(i) Find value of h such that the points $A(-1, h)$, $B(3, 2)$ and $C(7, 3)$ are collinear.

(ii) The points $(4, -2)$, $(-2, 4)$ and $(5, 5)$ are the vertices of a triangle. Find in-centre of the triangle.

(iii) Find the area of region bounded by the triangle with vertices $(a,\ b + c)$, $(a,\ b - c)$ and $(-a,\ c)$

(iv) Find the equation of the perpendicular bisector joining points $A(3, 5)$ and $B(9, 8)$.

(v) Find K so that the line joining $A\ (7, 3)$, $B\ (K, -6)$ and line joining $C\ (-4, 5)$, $D\ (-6, 4)$ are perpendicular.

(vi) Find an equation of the circle having the join of $A\ (x_1, y_1)$ and $B\ (x_2, y_2)$ as a diameter.

(vii) Which conics are called central conics?

(viii) Find centre and directrices of the ellipse whose equation is $\dfrac{(2x-1)^2}{4} + \dfrac{(y+2)^2}{16} = 1$

(ix) The point of a parabola which is closest to the focus is the vertex of the parabola.

(x) Find a and b so that the vectors $3\underline{i} - \underline{j} + 4\underline{k}$ and $a\underline{i} + b\underline{j} - 2\underline{k}$ are parallel.

(xi) Prove that $\sin(\alpha - \beta) = \sin\alpha\ Cos\beta - Cos\alpha\ \sin\beta$

(xii) Find volume of tetrahedron whose vertices are $(2, 1, 8)$, $(3, 2, 9)$, $(2, 1, 4)$ and $(3, 3, 10)$

(xiii) A force of magnitude 6 units acting parallel to $2\underline{i} - 2\underline{j} + \underline{k}$ displaces the point of application from $(1, 2, 3)$ to $(5, 3, 7)$. Find the work done.

SECTION-II

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

5.(a) Prove that $\underset{x \to 0}{Lim} \dfrac{a^x - 1}{x} = \ell_e\, a$

(b) If $y = x^4 + 2x^2 + 2$ then prove that $\dfrac{dy}{dx} = 4x\sqrt{y-1}$

6.(a) Evaluate $\int \sqrt{a^2 + x^2}\ dx$

(b) Find an equation of the line through the point of intersection of the lines $\ell_1 : 3x - 4y - 10 = 0$, $\ell_2 : x + 2y - 10 = 0$ and perpendicular to the line $\ell : 3x - 4y + 1 = 0$

7. (a) Evaluate $\int_0^{\pi/4} \dfrac{Cos\,x + Sin\,x}{Cos\,2x + 1}\ dx$

(b) Graph the feasible region of linear inequalities $2x + y \le 10$, $x + 4y \le 12$, $x + 2y \le 10$

8. (a) Show that the lines $3x - 2y = 0$ and $2x + 3y - 13 = 0$ are tangents to the circle $x^2 + y^2 + 6x - 4y = 0$

(b) Prove that the angle in a semicircle is a right angle.

9.(a) Find an equation of parabola with focus $(-3, 1)$ and directrix $x - 2y - 3 = 0$

(b) If $\underline{a} + \underline{b} + \underline{c} = 0$, then prove that $\underline{a} \times \underline{b} = \underline{b} \times \underline{c} = \underline{c} \times \underline{a}$