MATHEMATICS **Intermediate Part-II , Class 12^{th} (1^{st}A 424)** **GROUP: II**

Time: 2:30 hours **PAPER: II**

SUBJECTIVE **Marks: 80**

Note: Section I is compulsory. Attempt any three (3) questions from Section II.

SECTION I

2. Write short answers to any EIGHT questions: **(2 x 8 = 16)**

i- Define rational function. Give one example also.

ii- Find gof(x) , when $f(x)=\sqrt{x+1}$; $g(x)=\frac{1}{x^2}$, $x\neq 0$

iii- Evaluate $\lim\limits_{\theta\to 0}\frac{1-\cos\theta}{\theta}$

iv- Find 'c' so that $\lim\limits_{x\to -1} f(x)$ exists, when $f(x)=\begin{cases} x+2 & , \quad x\le -1 \\ c+2 & , \quad x>-1 \end{cases}$

v- Differentiate $(x^2+5)(x^3+7)$ w.r.t x.

vi- Find derivative of $\tan^3\theta\sec^2\theta$ w.r.t θ.

vii- Find $\frac{dy}{dx}$, if $y=\sinh^{-1}\left(\frac{x}{2}\right)$

viii- Define critical value and critical point of function f.

ix- Differentiate $\cot^{-1}\left(\frac{x}{a}\right)$ w.r.t x.

x- Find derivative of $\frac{x^2+1}{x^2-3}$ w.r.t x.

xi- State product rule for derivative of two functions.

xii- Differentiate $\sin^2 x$ w.r.t $\cos^4 x$.

3. Write short answers to any EIGHT questions: **(2 x 8 = 16)**

i- Find δy if $y=x^2-1$ and x changes from 3 to 3.02

ii- Evaluate $\int\frac{(1-\sqrt{x})^2}{\sqrt{x}}dx$

iii- Evaluate $\int\frac{dx}{x(\ln 2x)^3}$; $(x>0)$

iv- Evaluate $\int x\tan^2 x\,dx$

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

vi- Evaluate $\int_0^{\pi/6} x\cos x\,dx$

vii- Solve the differential equation $\sin y\,\text{cosec}\,x\frac{dy}{dx}=1$

viii- Find the distance and midpoint of line joining A(−8 , 3) and B(2 , −1).

ix- Find an equation of line with x-intercept:−9 and slope:−4

x- Transform the equation $5x-12y+39=0$ into slope intercept form.

xi- Determine the value of P such that the lines $2x-3y-1=0$, $3x-y-5=0$ and $3x+Py+8=0$ meet at a point.

xii- Find the angle between the lines represented by $x^2-xy-6y^2=0$

(Turn over)

4. Write short answers to any NINE questions: **(2 x 9 = 18)**

i- Define feasible region.

ii- Graph the feasible region of inequality $3x+2y \geq 6$, $x \geq 0$, $y \geq 0$

iii- Write an equation of circle with centre (5 , –2) and radius 4.

iv- Write down equation of tangent to $x^2+y^2=25$ at (4 , 3)

v- Find the focus and vertex of parabola $y^2=8x$

vi- Write equation of the ellipse whose foci $(\pm 3, 0)$ and minor axis of length 10.

vii- Find the foci and eccentricity of $\frac{x^2}{4}-\frac{y^2}{9}=1$

viii- Find the length of tangent drawn from point $(-5, 4)$ to the circle $x^2+y^2-2x+3y-26=0$

ix- Find a unit vector in the same direction of the vector $\underline{v}=[3, -4]$

x- Write the direction cosine of vector $\underline{v}=-\hat{i}+\hat{j}+\hat{k}$

xi- Find a scalar 'α' so that vectors $2\hat{i}+\alpha\hat{j}+5\hat{k}$ and $3\hat{i}+\hat{j}+\alpha\hat{k}$ are perpendicular.

xii- If $\underline{a}=4\hat{i}+3\hat{j}+\hat{k}$ and $\underline{b}=2\hat{i}-\hat{j}+2\hat{k}$, find $|\underline{a}\times\underline{b}|$

xiii- A force $\underline{F}=4\hat{i}-3k$ passes through $A(2,-2,5)$. Find its moment about $B(1,-3,1)$.

SECTION II

5- **(a)** Evaluate : $\lim_{\theta\to 0}\frac{1-\cos p\theta}{1-\cos q\theta}$ 5

(b) Differentiate : $\operatorname{Sec}^{-1}\left(\frac{x^2+1}{x^2-1}\right)$ w.r.t "x" 5

6- **(a)** If $y=e^x \operatorname{Sin}x$; show that $\frac{d^2y}{dx^2}-2\frac{dy}{dx}+2y=0$ 5

(b) Evaluate : $\int \operatorname{Cosec}^3 x\, dx$ 5

7- **(a)** Evaluate : $\int_0^{\pi/4}\frac{\operatorname{Sin}x-1}{\operatorname{Cos}^2 x}dx$ 5

(b) Graph the feasible region of the following system of linear inequalities and find the corner points 5

$2x-3y \leq 6$

$2x+3y \leq 12$

$x \geq 0$, $y \geq 0$

8- **(a)** Find an equation of the circle passing through the points A(1 , 2) and B(1 , –2) and touching the line $x+2y+5=0$ 5

(b) Use vectors, to prove that the diagonals of a parallelogram bisect each other. 5

9- **(a)** Find the equation of perpendicular bisector of a segment joining the points A(3 , 5) and B(9 , 8). 5

(b) Find the equation of parabola with focus (–3 , 1) and directrix x = 3. 5