Roll No. [ ] (To be filled in by the candidate)

Mathematics **H.S.S.C (12th)1st Annual 2023** Time : 30 Minutes

Paper : II SWL-12-23 Objective – (ii) Marks : 20

Paper Code 8 1 9 3

Note: –You have four choices for each objective type question as A, B, C and D. The choice which you think is correct; fill that circle in front of that question number in your answer book. Use marker or pen to fill the circles. Cutting or filling up two or more circles will result no mark.

SECTION–A

Q.1	Questions	A	B	C	D
1.	Focus of parabola $x^2=4ay$ is	(a,0)	(0,a)	(−b,0)	(0,−a)
2.	Two lines l_1 and l_2 with slope m_1 and m_2 are perpendicular if:	$m_1=m_2$	$m_1m_2=1$	$m_1m_2+1=0$	$m_1=\frac{2}{m_2}$
3.	The lines represented by $ax^2+2hxy+by^2=0$ are parallel if:	$h^2-ab=0$	$h^2-ab>0$	$h^2-ab<0$	$h^2=a+b$
4.	A solution of $x+2y<6$ is:	(8,0)	(0,8)	(5,1)	(1,2)
5.	The line $y=mx+c$ intersect the circle $x^2+y^2=a^2$ at most ________ point/s	One	Two	three	Infinite
6.	Equation of point circle is:	$x^2+y^2=1$	$x^2+y^2=-1$	$x^2+y^2=0$	$x^2-y^2=0$
7.	Equation of horizontal line through (a,b) is	$y=a$	$x=a$	$x=b$	$y=b$
8.	For hyperbola value of eccentricity is:	$e=0$	$e<1$	$e=1$	$e>1$
9.	If $f(x)=e^{\sqrt{x}-1}$, then $f'(x)=$.......	$\frac{1}{2\sqrt{x}}e^{\sqrt{x}-1}$	$e^{\sqrt{x}-1}$	$\frac{1}{2x}$	$\frac{e^{\sqrt{x}-1}}{\sqrt{x}}$
10.	$\int\frac{x+2}{x+2}dx=$.......	1+c	x+c	−x+c	2x
11.	$\lim_{\theta\to0}\frac{1-\cos\theta}{\theta}=$.......	1	0	−1	∞
12.	$\lim_{n\to\infty}(1-\frac{1}{n})^n=$.......	e^{-1}	e	e^2	$\frac{1}{e^2}$
13.	If $x=at^2, y=2at$, then $\frac{dy}{dx}=$.......	$\frac{2}{y}$	$\frac{2a}{y}$	$2ay$	$2a$
14.	$\underline{i}\cdot(\underline{i}\times\underline{k})=$.......	$\underline{i}$	$-\underline{j}$	0	1
15.	If $f(x)=\cos x$, then $f'(\sin^{-1}x)=$.......	$-\sin x$	$-x$	1	$\frac{1}{\sqrt{1-x^2}}$
16.	If $y=e^{2x}$, then $y_4=$.......	$16e^{2x}$	$8e^{2x}$	$4e^{2x}$	$-16e^{2x}$
17.	The projection of $\vec{a}=\underline{i}-\underline{j}$ along $\underline{b}=\underline{j}+\underline{k}$ is:	$\frac{1}{\sqrt{2}}$	$\frac{-1}{\sqrt{2}}$	1	−2
18.	The order of differential equation $y\left(\frac{dy}{dx}\right)^2+2x=0$ is:	1	−1	2	−2
19.	$\int_{\pi/6}^{\pi/3}\cos\theta\,d\theta=$.......	$\frac{\sqrt{3}-1}{2}$	$\frac{\sqrt{3}}{2}$	$1+\frac{1}{\sqrt{3}}$	$\frac{2}{\sqrt{3}}-1$
20.	$\int \ln x\,dx=$.......	$(\ln x)^2+c$	$x\ln x+c$	$x\ln x-x+c$	$-x\ln x+c$

Roll No. | | | | | | (To be filled in by the candidate)

Mathematics **H.S.S.C (12th)1st Annual 2023** Time : 2:30 Hours

Paper : II SWL-12-23 Subjective Marks : 80

Note: - Section B is compulsory. Attempt any three questions from section C.

SECTION – B

2. Write short answers to any Eight parts. **(8 x 2 = 16)**

i. Express the volume V of a cube as a function of the area of its base

ii. For any real valued function, $g(x)=\dfrac{1}{\sqrt{x^2}}$; $x\neq 0$,find $gog(x)$

iii. Evaluate $\lim\limits_{x\to 0}\dfrac{1-\cos x}{\sin^2 x}$

iv. Differentiate $\dfrac{2x-3}{2x+1}$ w.r.t. x

v. Find $\dfrac{dy}{dx}$ if $x^2-4xy-5y=0$

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

vii. Find $f'(x)$ if $f(x)=\ln(e^x+e^{-x})$

viii. Find y_2 if $y=x^2e^{-x}$

ix. Apply Maclaurin series expansion to prove that, $\sqrt{1+x}=1+\dfrac{x}{2}-\dfrac{x^2}{8}+\dfrac{x^3}{16}+\ldots$

x. Find the extreme values for the function, $f(x)=x^2-x-2$

xi. Define objective function.

xii. Graph the solution set of the inequality, $3x-2y\geq 6$

3. Write short answers to any Eight parts. **(8 x 2 = 16)**

i. Evaluate $\int\dfrac{3x+2}{\sqrt{x}}dx,\quad (x>0)$

ii. Evaluate $\int\dfrac{e^{2x}+e^x}{e^x}dx$

iii. Evaluate $\int \sec n\ dx$

iv. Evaluate $\int\dfrac{x}{\sqrt{4+x^2}}dx$

v. Evaluate $\int a^{x^2}x\ dx\quad (a>0,\ a\neq 1)$

vi. Evaluate $\int\dfrac{x+b}{(x^2+2bx+c)^{\frac{1}{2}}}dx$

vii. Evaluate definite integral $\int_1^2(x^2+1)dx$

viii. Find the volume of the parallelepiped determined by, $\underline{u}=\underline{i}+2\underline{j}-\underline{k}$, $\underline{v}=\underline{i}-2\underline{j}+3\underline{k}$, $\underline{w}=\underline{i}-7\underline{j}-4\underline{k}$

ix. Find the value of $[\underline{i}\quad \underline{i}\quad \underline{k}]$

x. Find the constant α such that the given vectors are coplanar. $\underline{i}-\underline{j}+\underline{k}$, $\underline{i}-2\underline{j}-3\underline{k}$ and $3\underline{i}-\alpha\underline{j}+5\underline{k}$

xi. Write the formula to find the volume of tetrahedron.

xii. Write two properties of cross product.

(Turn Over)

SWL-12-23

4. **Write short answers to any Nine parts.** **(9 x 2 = 18)**

i. Find distance between A and B, midpoint of AB, where A(3,1), B(-2,-4)

ii. Find slope and inclination of line joining A(3,-2) and B(2,7)

iii. By means of slope, show that (-1,-3),(1,5) and (2,9) are collinear.

iv. Find equation of line through A(-6,5) having slope 7

v. Find point of intersection of $x-2y+1=0$ *and* $2x-y+2=0$

vi. Find the lines represented by $2x^2+3xy-5y^2=0$

vii. Find the distance from P(6,-1) to the line $6x-4y+9=0$

viii. Find the equation of circle with centre (5,-2) and radius 4

ix. Write down equation of tangent and normal to $x^2+y^2=25$ at (4,3)

x. Write equation of parabola with Focus (1,2); vertex (3,2)

xi. Find foci and eccentricity of the ellipse $x^2+4y^2=16$

xii. Find equation of hyperbola with centre (0,0) Focus (6,0) and vertex (4,0)

xiii. Find centre and radius of circle $4x^2+4y^2-8x+12y-25=0$

SECTION – C

Note: Attempt any Three questions. Each question carries 10 marks

5. (a) Evaluate the following limit 5

$$\lim_{\theta\to 0}\frac{1-\cos p\theta}{1-\cos q\theta}$$

(b) Show that $\frac{dy}{dx}=\frac{y}{x}$ if $\frac{y}{x}=\tan^{-1}\frac{x}{y}$ 5

6. (a) Evaluate $\int\frac{e^x(1+\sin x)}{1+\cos x}dx$ 5

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

7. (a) Evaluate $\int_0^{\frac{\pi}{4}}\frac{1}{1+\sin x}dx$ 5

(b) Minimize $z=2x+y$, subject to the constraints $x+y\geq 3;\ 7x+5y\leq 35;\ x\geq 0;\ y\geq 0$ 5

8. (a) Divide 20 into two parts so that the sum of their squares will be minimum. 5

(b) Find equations of the tangents to the circle $x^2+y^2=2$ parallel to the $x-2y+1=0$ 5

9. (a) Find the centre, foci, eccentricity, vertices and directrices of ellipse $x^2+16x+4y^2-16y+76=0$ 5

(b) Prove that by vector method $\sin(\alpha+\beta)=\sin\alpha\cos\beta+\cos\alpha\sin\beta$ 5

Roll No. | | | | | | (To be filled in by the candidate)

Mathematics | **H.S.S.C (12th)-A-2022** | Time : 30 Minutes

Paper : II | Objective – (iv) | Marks : 20

Paper Code	8	1	9	7

SWL-22

Note: –You have four choices for each objective type question as A, B, C and D. The choice which you think is correct; fill that circle in front of that question number in your answer book. Use marker or pen to fill the circles. Cutting or filling up two or more circles will result no mark.

SECTION–A

Q.1	Questions	A	B	C	D
1.	$\int 2^x dx =$	$2^x + c$	$2^x . ln2 + c$	$\frac{ln2}{2^x} + c$	$\frac{1}{ln2} . 2^x + c$
2.	$\int_0^3 \frac{1}{9+x^2} dx =$	$\frac{\pi}{4}$	$\frac{\pi}{6}$	$\frac{\pi}{12}$	$\frac{\pi}{8}$
3.	Slope of vertical line is:	0	∞	1	-1
4.	Two lines $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$, are perpendicular if:	$a_1a_2 + b_1b_2 = 0$	$a_1a_2 - b_1b_2 = 0$	$a_1b_2 + a_2b_1 = 0$	$a_1b_2 - a_2b_1 = 0$
5.	The distance of the line $4x - 3y - 25 = 0$ from the origin is:	1	5	25	2
6.	Normal form of the equation of straight line is:	$y = mx + c$	$y - y_1 = m(x - x_1)$	$\frac{x}{a} + \frac{y}{b} = 1$	$x\cos\alpha + y\sin\alpha = p$
7.	$2x + y < 6$ is satisfied by which point?	$(3,1)$	$(1,3)$	$(0,7)$	$(4,0)$
8.	Equation of the tangent to the circle $x^2 + y^2 = 4$ at $(1,3)$ is:	$x + 3y = 4$	$x - 3y = 4$	$3x + y = 4$	$3x - y = 4$
9.	$Sin h^{-1} x =$	$\frac{e^x + e^{-x}}{2}$	$\frac{e^x - e^{-x}}{2}$	$\frac{e^x - e^{-x}}{e^x + e^{-x}}$	$\frac{e^x + e^{-x}}{e^x - e^{-x}}$
10.	If $g(x) = \frac{1}{x^2}$, $x \neq 0$, then $gog(x) =$	x^2	$\frac{1}{x^2}$	x^4	$\frac{1}{x^4}$
11.	Derivative of $\left(x^3+1\right)^9$ w.r.t. x^3 equals:	$9\left(x^3+1\right)^8$	$27x^2\left(x^3+1\right)^8$	$3x\left(x^3+1\right)^8$	$27\left(x^3+1\right)^8$
12.	If $\lim_{x \to a} \frac{f(x) - f(a)}{x - a}$ exists, then it is equal to:	$f'(x)$	$f'(a)$	*zero*	∞
13.	Length of latus-rectum of ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, is:	$\frac{2a^2}{b}$	$\frac{2b^2}{a}$	$\frac{b^2}{2a}$	$\frac{b}{2a^2}$
14.	Centre of the Hyperbola $\frac{(x+1)^2}{9} - \frac{(y-2)^2}{4} = 1$, is:	$(1,2)$	$(2,1)$	$(-1,2)$	$(1,-2)$
15.	Unit vector perpendicular to $\underline{a}$ and $\underline{b}$ is:	$\frac{\underline{a} \times \underline{b}}{\lvert\underline{a}\rvert\lvert\underline{b}\rvert}$	$\frac{\underline{a} . \underline{b}}{\lvert\underline{a}\rvert\lvert\underline{b}\rvert}$	$\frac{\underline{a} . \underline{b}}{\underline{a} \times \underline{b}}$	$\frac{\underline{a} \times \underline{b}}{\lvert\underline{a} \times \underline{b}\rvert}$
16.	$2\underline{i} \cdot \underline{j} \times \underline{k} =$	2	Zero	$\frac{1}{2}$	∞
17.	$\int e^{\tan^{-1} x} \cdot \frac{1}{1+x^2} dx =$	$e^{\tan^{-1} x} + c$	$\frac{1}{1+x^2} + c$	$e^{\cos^{-1} x} + c$	$e^{\sec^2 x} + c$
18.	$\int e^x (1+x) dx =$	$e^x + c$	$xe^x + c$	$x^2 + c$	$\frac{1}{2} x^2 e^x + c$
19.	If $y = ln\left(x^2\right)$, then $\frac{dy}{dx} =$	$\frac{1}{x^2}$	$\frac{1}{2x^2}$	$\frac{2}{x}$	$\frac{2}{x^2}$
20.	$\frac{d}{dx}\left(\cos x^2\right) =$	$-\sin x^2$	$-2x \sin x^2$	$2x \sin x^2$	$-x \sin x^2$

Roll No. | | | | | | (To be filled in by the candidate)

Mathematics H.S.S.C (12th)-A-2022 Time : 2:30 Hours

Paper : II Subjective Swl-22 Marks : 80

Note: - Section B is compulsory. Attempt any three questions from section C.

SECTION – B

2. Write short answers to any Eight parts. **(8 x 2 = 16)**

i. Determine whether the function $f(x)=\sin x+\cos x$ is even or odd.

ii. Find the composition function $fof(x)$ if $f(x)=\dfrac{1}{\sqrt{x-1}}$

iii. Express $\lim\limits_{n\to\infty}\left(1+\dfrac{3}{n}\right)^{2n}$ in term of "e".

iv. What is the implicit function?

v. Evaluate $\lim\limits_{x\to 0}\dfrac{\sin x^{\circ}}{x}$

vi. Differentiate $\dfrac{2x-3}{2x+1}$ w.r.t. x

vii. Find $\dfrac{dy}{dx}$ if $y^2-xy-x^2+4=0$

viii. Find derivative of $(\sin 2\theta-\cos 3\theta)^2$ w.r.t θ

ix. If $y=x^2\,ln\left(\dfrac{1}{x}\right)$, find $\dfrac{dy}{dx}$

x. Find y_2 if $y=x^2e^{-x}$

xi. Find the intervals in which $f(x)=4-x^2; x\in(-2,2)$ is increasing or decreasing.

xii. Differentiate $\log_{10}(ax^2+bx+c)$ w.r.t. x

3. Write short answers to any Eight parts. **(8 x 2 = 16)**

i. Using differentials find $\dfrac{dy}{dx}$ in the equation $xy+x=4$

ii. Evaluate $\int \sin^2 x\,dx$

iii. Evaluate $\int \dfrac{\sec^2 x}{\sqrt{\tan x}}dx$

iv. Evaluate $\int \tan^{-1} x\,dx$

v. Evaluate $\int e^{-x}(\cos x-\sin x)\,dx$

vi. Evaluate $\int \dfrac{3x+1}{x^2-x+6}dx$

vii. Evaluate $\int_1^2 ln\,x\,dx$

viii. Find the area between the $x-axis$ and the curve $y=4x-x^2$.

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

x. Find an equation of line passing through $A(-5,-3)$ and $B(9,-1)$.

xi. Find an equation of the line through $(-4,7)$ and parallel to the line $2x-7y+4=0$

xii. Find lines represented by $3x^2+7xy+2y^2=0$

(Turn Over)

4. Write short answers to any Nine parts. **(9 x 2 = 18)**

i. How would you obtain the optimal solution from feasible region?

ii. Indicate the solution region of $3x-2y\geq 6$

iii. Find an equation of the circle passing through $A(1,4), B(-1,8)$ and tangent to the line $x+3y-3=0$

iv. Write down the equation of normal to circle $3x^2+3y^2+5x-13y+2=0$ at $\left(1,\frac{10}{3}\right)$.

v. Investigate vertex and directrix of $x+8-y^2+2y=0$

vi. Form the equation of ellipse from that data, foci $(\pm 3,0)$ and minor axis of length 10.

vii. Find foci and eccentricity of $\frac{y^2}{16}-\frac{x^2}{9}=1$

viii. Use vectors, to prove that the diagonals of a parallelogram bisect each other.

ix. For what values of a and b from the given parallel vectors $3\underline{i}-\underline{j}+4\underline{k}$ *and* $a\underline{i}+b\underline{j}-2\underline{k}$

x. Prove that in any triangle ABC: $a=b\cos C+c\cos B$

xi. Find area of parallelogram, where vertices are $A(-1,1,1), B(-1,2,2), C(-3,4,-5)$ and $D(-3,5,-4)$.

xii. Find α from the given coplanar vectors $\underline{i}-2\alpha\underline{j}-\underline{k}$, $\underline{i}-\underline{j}+2\underline{k}$ and $\alpha\underline{i}-\underline{j}+\underline{k}$

xiii. A force $\underline{F}=3\underline{i}+2\underline{j}-4\underline{k}$ is applied at the point $(1,-1,2)$. Find the moment of the force about the point $(2,-1,3)$

SECTION – C

(Each question carries 10 marks)

5. (a) If $f(x)=\begin{cases}3x & if\ x\leq -2\\ x^2-1 & if\ -2<x<2\\ 3 & if\ x\geq 2\end{cases}$ **5**

Discuss the continuity at $x=2$ and $x=-2$

(b) Differentiate $\frac{x^2+1}{x^2-1}$ w.r.t $\frac{x-1}{x+1}$ **5**

6. (a) Evaluate $\int\frac{dx}{\sqrt{7-6x-x^2}}$ **5**

(b) Find h such that the points $A(h,1), B(2,7)$ and $C(-6,-7)$ are vertices of a right triangle. **5**

7. (a) Find area between the $x-axis$ and the curve $y=\sqrt{2ax-x^2}$ when $a>0$ **5**

(b) Graph the feasible region of the following system of linear inequality and find corner points $2x+3y\leq 18,\quad 2x+y\leq 10,\quad x+4y\leq 12,\quad x\geq 0,\quad y\geq 0$ **5**

8. (a) Find a joint equation of the straight lines through the origin and perpendicular to the lines represented by $x^2+xy-6y^2=0$ **5**

(b) Find an equation of the parabola whose focus is $F(-3,4)$ and directrix is $3x-4y+5=0$ **5**

9. (a) Find centre, foci, eccentricity and vertices of hyperbola $4x^2-8x-y^2-2y-1=0$ **5**

(b) Prove that $\sin(\alpha-\beta)=\sin\alpha\cos\beta+\cos\alpha\sin\beta$ **5**

Paper : II | Objective – (III) | Marks : 20

Paper Code	8	1	9	5

SWL-21

Note: – You have four choices for each objective type question as A, B, C and D. The choice which you think is correct; fill that circle in front of that question number in your answer book. Use marker or pen to fill the circles. Cutting or filling up two or more circles will result no mark.

Q.1	Questions	A	B	C	D
1.	The conic is called circle if:	$e=1$	$e<1$	$e=0$	$e>1$
2.	The direction cosines of $Z-axis$ are:	$(1,0,0)$	$(0,1,0)$	$(0,0,1)$	$(0,0,0)$
3.	Angle between nonzero vectors $\underline{a}$ and $\underline{a}\times\underline{b}$ is:	0	$\frac{\pi}{6}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$
4.	Distance between $(-1,2)$ and $(7,5)$ is:	± 7	$\sqrt{73}$	73	$\sqrt[2]{73}$
5.	Opening of parabola $x^2=-16y$ is:	downward	upward	left	right
6.	If $\underline{u}$ and $\underline{v}$ are parallel vectors having same direction then $\underline{u}.\underline{v}$ is equal to:	$-uv$	uv	$uv\ sin\theta$	$uv\tan\theta$
7.	If $f(x)=\sqrt{x+4}$ then $f(x-1)$ is equal to:	$\sqrt{x+4}$	$\sqrt{x+3}$	$\sqrt{x+2}$	$\sqrt{x+1}$
8.	The distance of point $(1,-2)$ from $Y-axis$ is:	2	3	4	1
9.	Vertices of $\frac{y^2}{16}-\frac{x^2}{49}=1$ are:	$(\pm 4,0)$	$(0,\pm 4)$	$(0,\pm 7)$	$(\pm 7,0)$
10.	Inclination of line perpendicular to $Y-axis$ is:	$\frac{\pi}{3}$	$\frac{\pi}{6}$	$\frac{\pi}{2}$	zero
11.	$\frac{d}{dx}\left(Sin^2x+Cos^2x\right)$ is equal to:	zero	1	2	3
12.	$\int e^x(x+1)dx$ is equal to:	e^x+c	xe^x+c	x^2e^x+c	$\frac{xe^x}{2}+c$
13.	$\int_0^{\pi} Cos\,x\,dx$ is equal to:	2	-1	zero	2
14.	If $V=x^3$ then differential of V is:	$3x^2$	$3x^2\,dv$	$x^3\,dv$	$3x^2\,dx$
15.	If $f'(c)=0$, then f has relative minima at C if $f''(c)$ is:	negative	zero	any value	positive
16.	$\frac{d}{dx}\left(Sin^{-1}x\right)$ is equal to:	$\frac{-1}{\sqrt{1-x^2}}$	$\frac{1}{\sqrt{x^2-1}}$	$\frac{1}{\sqrt{1-x^2}}$	$\frac{-1}{\sqrt{x^2-1}}$
17.	The general solution of $\frac{1}{x}\frac{dy}{dx}-2y=0$ is:	$y=ce^x$	ce^x	ce^{-x}	$ce^{x/2}$
18.	$\frac{d}{dx}\left[\sin\left(\frac{1}{x}\right)\right]$ is equal to:	$x\,Cos\frac{1}{x}$	$\frac{-1}{x^2}Cos\frac{1}{x}$	$\frac{1}{x^2}Cos\frac{1}{x}$	$\frac{-1}{x}Cos\frac{1}{x}$
19.	$\lim_{n\to\infty}\left(1+\frac{1}{3n}\right)^n$ is equal to:	$e^{1/3}$	e	e^2	e^3
20.	$x=0$ is solution of inequality:	$2x-1<0$	$2x+1<0$	$x<0$	$x<-1$

ematics　　　　Inter (Part-II)-A-2021　　　　Time : 2:30 Hours

per : II　　　　Subjective SWL-21　　　　Marks : 80

Note: - Section I is compulsory. Attempt any three questions from section II.

Section – I

2. Write short answers to any Eight parts. **(8 x 2 = 16)**

i. Given $f(x)=x^3-ax^2+bx+1$. if $f(2)=-3$ and $f(-1)=0$. Find the value of a and b.

ii. Find $f^{-1}(x)$ if $f(x)=(-x+9)^3$

iii. Express the $\lim_{n\to+\infty}\left(1+\frac{3}{n}\right)^{2n}$ in terms of "e".

iv. Evaluate $\lim_{x\to 0}\frac{1-\cos 2x}{x^2}$

v. Differentiate $\left(\sqrt{x}-\frac{1}{\sqrt{x}}\right)^2$ w.r.t "x"

vi. Find $\frac{dy}{dx}$ if $x=at^2$ and $y=2at$

vii. Prove that $\frac{d}{dx}\left(\cos^{-1}x\right)=\frac{-1}{\sqrt{1-x^2}}$

viii. Find $\frac{dy}{dx}$ if $y=x\cos y$

ix. Find $\frac{dy}{dx}$ if $y=e^{-x}\left(x^3+2x^2+1\right)$

x. Find $\frac{dy}{dx}$ if $y=e^{-2x}.\ Sin 2x$

xi. Find y_2 if $y=2x^5-3x^4+4x^3+x-2$

xii. Apply the Maclaurin series expansion to prove that $e^x=1+x+\frac{x^2}{\lfloor 2}+\frac{x^3}{\lfloor 3}+\frac{x^4}{\lfloor 4}+\ldots\ldots$

3. Write short answers to any Eight parts. **(8 x 2 = 16)**

i. Find dy if $y=x^2-1$, when x changes from 3 to 3.02

ii. Evaluate $\int\frac{3x+2}{\sqrt{x}}dx \quad (x>0)$

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

iv. Evaluate $\int\frac{1}{x\ln x}dx$

v. Evaluate $\int x^4 \ln x\ dx$

vi. Evaluate $\int_{-1}^{1}\left(x^{1/3}+1\right)dx$

vii. Find the area above the $x-axis$ and under the curve $y=5-x^2$ from $x=-1$ to $x=2$

viii. Solve the differential equation $\frac{dy}{dx}=\frac{y}{x^2}$

ix. Find an equation of line through $A(-6,5)$ having slope 7.

x. Find the lines represented by $x^2-2xy\sec\alpha+y^2=0$

xi. The points $A(-5,-2)$ and $B(5,-4)$ are ends of diameter of a circle. Find the centre of that circle.

xii. Check whether the point $(-7,6)$ lies above or below the line $4x+3y-9=0$

(Turn Over)

SWL-21

4. Write short answers to any Nine parts. **(9 x 2 = 18)**

i. Graph the solution set of the linear inequality in $xy-plane$ given by $2x+y\le 6$.

ii. Find the equation of the circle with ends of a diameter at (-3,2) and (5,-6).

iii. Show that the circles $x^2+y^2+2x-2y-7=0$ and $x^2+y^2-6x+4y+9=0$ touch externally.

iv. Find the length of the chord cut off from the line $2x+3y=13$ by the circle $x^2+y^2=26$.

v. Write the equation of a parabola with focus (-3,1) and directrix $x=3$

vi. Find the centre and foci of $\frac{x^2}{4}-\frac{y^2}{9}=1$

vii. Find a unit vector in the direction of the vector $\underline{v}=[-2,4]$

viii. Find equation of normal to the curve $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ at $(a\cos\theta, b\sin\theta)$.

ix. Find α so that $\left|\alpha\underline{i}+(\alpha+1)\underline{j}+2\underline{k}\right|=3$.

x. Find the cosine of the angle between $\underline{u}=[2,-3,1]$ *and* $\underline{v}=[2,4,1]$.

xi. Compute the product $\underline{a}\times\underline{b}$, $\underline{a}=-4\underline{i}+\underline{j}-2\underline{k}$ *and* $\underline{b}=2\underline{i}+\underline{j}+\underline{k}$.

xii. Find α so that the vectors $\alpha\underline{i}+\underline{j}$, $\underline{i}+\underline{j}+3\underline{k}$ *and* $2\underline{i}+\underline{j}-2\underline{k}$ are coplaner.

xiii. Find equation of tangent to $x^2-2y^2=2$ through $(1,-2)$.

Section – II
(Each question carries 10 marks)

5. (a) Evaluate $\lim_{\theta\to 0}\frac{\tan\theta-\sin\theta}{\sin^3\theta}$ **5**

(b) If $x=a\cos^3\theta$, $y=b\sin^3\theta$, show that $a\frac{dy}{dx}+b\tan\theta=0$ **5**

6. (a) Evaluate $\int\frac{\sqrt{2}}{\sin x+\cos x}\,dx$ **5**

(b) Find an equation of the line through the intersection of the lines $x+2y+3=0$, $3x+4y+7=0$ and making equal intercepts on the axes. **5**

7. (a) Solve the differential equation $\sec x+\tan y\frac{dy}{dx}=0$ **5**

(b) Minimize $z=3x+y$; subject to the constraints:
$3x+5y\ge 15$; $x+6y\ge 9$ $x\ge 0$; $y\ge 0$ **5**

8. (a) Write equation of circle that passes through the points $A(5,6)$, $B(-3,2)$ and $C(3,-4)$. **5**

(b) Prove that: $\cos(\alpha+\beta)=\cos\alpha\cos\beta-\sin\alpha\sin\beta$ **5**

9. (a) If $y=e^x\sin x$, then show that $\frac{d^2y}{dx^2}-2\frac{dy}{dx}+2y=0$ **5**

(b) Find centre, foci, eccentricity and vertices of $\frac{y^2}{16}-\frac{x^2}{9}=1$ **5**