Make up Examination-Sept.2023
I/II Semester Diploma Examination
ENGINEERING MATHEMATICS (20SC01T)

(Exam Date/Time: 23rd Sep.2023/2.00pm-5.00pm)

Time: 3 Hours] [Max .Marks: 100

Instructions: (1) Answer all questions. (2) Each section carries 20 marks.

Section-I

1. (a) If $A=\begin{bmatrix}2 & 1\\ 3 & 4\end{bmatrix}$ *and* $B=\begin{bmatrix}1 & 4\\ 2 & 3\end{bmatrix}$, then find $2A+3B$. 4

OR

If $\mathrm{A}=\begin{bmatrix}3 & 2\\ 2 & 0\end{bmatrix}$ then find $\mathrm{A}+\mathrm{A}^{\mathrm{T}}$ matrix.

(b) Find the characteristics roots of the matrix $A=\begin{bmatrix}5 & 2\\ 4 & 3\end{bmatrix}$ 6

OR

Find the inverse of the matrix $A=\begin{bmatrix}\cos x & -\sin x\\ \sin x & \cos x\end{bmatrix}$

(c) Find the adjoint of the matrix $\mathrm{A}=\begin{bmatrix}2 & -1\\ -1 & 2\end{bmatrix}$ 5

OR

Solve the equations 2x+y=1; 3x+2y=1 by using Cramer's rule.

(d) If $\mathrm{A}=\begin{bmatrix}1 & 2\\ 3 & 4\end{bmatrix}$ and $\mathrm{B}=\begin{bmatrix}2 & 1\\ 3 & 4\end{bmatrix}$, find AB matrix and also find $(\mathrm{AB})^{\mathrm{T}}$ matrix. 5

OR

If $\begin{vmatrix}x & 2\\ 3 & 4\end{vmatrix}=\begin{vmatrix}3 & 2\\ 0 & x\end{vmatrix}$ find the value of x.

Section-II

2. (a) Find the equation of a straight line with slope 5 and y-intercept 3. 4

OR

Write the standard form of equation of straight line with

a) One point (x_1, y_1) having slope m.

b) Two points (x_1, y_1) and (x_2, y_2).

(b) Find the equation straight line passing through two points $(3,4)$ and $(5,6)$ 6

OR

Find equation of straight line passing through the point $(1,2)$ which makes an angle 45^{o} With positive direction of x - axis.

(c) Find the acute angle between the lines x-2y+1=0 and 2x+6y-5=0. 5

OR

Prove that the given straight lines 3x-4y-7=0 and 9x-12y-11=0 are parallel.

(d) Find the equation of straight line parallel to 5x+6y-10=0 and passing through the Point (-3, 3) 5

OR

Find the equation of the line cutting off equal intercepts and passing through the point (-2, 5)

Section-III

3. (a) Convert 120^0 into radian and $\frac{3\pi}{2}$ into degree 4

OR

Prove that $\sin 2A = 2\sin A\cos A$

(b) Prove that $\tan\left(45^0 + A\right) = \frac{1+\tan A}{1-\tan A}$ 6

OR

If $\tan A = \frac{5}{12}$ and $180^0 < A < 270^0$ then find the value of $\sin A$ *and* $\cos A$

.

(c) Simplify $\frac{\cos\left(360^0 - A\right)\tan\left(360^0 + A\right)}{\cot\left(270^0 - A\right)\sin\left(90^0 + A\right)}$ 5

OR

Prove that $\frac{1-\cos 2A + \sin 2A}{1+\cos 2A + \sin 2A} = \tan A.$

(d) Show that $\cos 100^0 + \cos 80^0 = 0$ 5

OR

Show that $\cos 20^0 \cos 40^0 \cos 80^0 = \frac{1}{8}.$

Section-IV

4. (a) If $y = x^3 + 3\cos x + 4e^x + 2$ then find $\frac{dy}{dx}$. 4

OR

If $y = (x+1)(x-1)$ then find $\frac{dy}{dx}$.

(b) Find the maximum and minimum value of a function $y = 2x^3 - 15x^2 + 36x + 6$ 6

OR

If $s = t^3 - 2t^2 + 6t + 8$ is the equation of motion of a particle in meters, find the acceleration at the end of 3 secs

(c) If $y = a\cos mx + b\sin mx$ then prove that $\frac{d^2y}{dx^2} + m^2 y = 0.$ 5

OR

Find the derivative of a function $\frac{1+\sin x}{1-\sin x}$ w.r.t.x.

(d) Find the equation of tangent to the curve $y = 1 - x^3$ at the point (2, 3) 5

OR

If $y = \left(1 + x^2\right)\tan^{-1} x$ then find $\frac{dy}{dx}$.

Section-V

5. (a) Evaluate $\int \tan^2 x \, dx$ 4

OR

Integrate the function $\sin x + \frac{1}{x} + x^3 - 7$ w.r.t.x.

(b) Find area bounded by the curve $y = x^2 + 2$, the x-axis and the ordinates at x=1 and x=2 6

OR

Find the volume of the solid generated by revolving the line $y^2=2x+1$ about x-axis between the ordinates x=0 and x=2

(c) Evaluate the indefinite integral $\int (x \sin x) dx$ using integration by parts. 5

OR

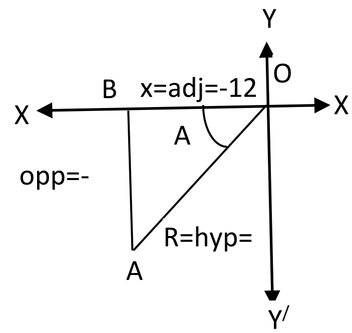
Evaluate $\int_0^1 \frac{(\tan^{-1} x)^4}{1+x^2} dx$

Section-I

Q No	Answers			Marks
1 (a)	$2A+3B=2\begin{bmatrix}2&1\\3&4\end{bmatrix}+3\begin{bmatrix}1&4\\2&3\end{bmatrix}$ $=\begin{bmatrix}4&2\\6&8\end{bmatrix}+\begin{bmatrix}3&12\\6&9\end{bmatrix}=\begin{bmatrix}7&14\\12&17\end{bmatrix}$	OR	If $A=\begin{bmatrix}3&2\\2&0\end{bmatrix}$ $\Rightarrow A^T=\begin{bmatrix}3&2\\2&0\end{bmatrix}$ $A+A^T=\begin{bmatrix}3&2\\2&0\end{bmatrix}+\begin{bmatrix}3&2\\2&0\end{bmatrix}=\begin{bmatrix}6&4\\4&0\end{bmatrix}$	4M
1(b)	$A=\begin{bmatrix}5&2\\4&3\end{bmatrix}\begin{bmatrix}a&b\\c&d\end{bmatrix}$ characteristic equation is given by $\lambda^2-(a+d)\lambda+(ad-bc)=0$ $\lambda^2-(5+3)\lambda+(15-8)=0$ $\lambda^2-8\lambda+7=0$ $\lambda^2-7\lambda-\lambda+7=0$ $\lambda(\lambda-7)-1(\lambda-7)=0$ $(\lambda-7)(\lambda-1)=0$ $\lambda=7$ *or* $\lambda=1$ $\therefore \lambda=7,1$ *are required characteristic roots*	OR	$A=\begin{bmatrix}\cos x&-\sin x\\\sin x&\cos x\end{bmatrix}$ $\|A\|=\begin{vmatrix}\cos x&-\sin x\\\sin x&\cos x\end{vmatrix}=\cos^2 x+\sin^2 x=1\neq 0$ Inter change principal diagonal elements and sign change secondary diagonal elements in matrix A to get adj(A) $adj(A)=\begin{bmatrix}\cos x&\sin x\\-\sin x&\cos x\end{bmatrix}$ $A^{-1}=\frac{1}{\|A\|}adj(A)=\frac{1}{1}\begin{bmatrix}\cos x&\sin x\\-\sin x&\cos x\end{bmatrix}$ $=\begin{bmatrix}\cos x&\sin x\\-\sin x&\cos x\end{bmatrix}$	6M
1(c)	If $A=\begin{bmatrix}2&-1\\-1&2\end{bmatrix}$ $CF\ of\ 2=\|2\|=2$ $CF\ of\ -1=-\|-1\|=1$ $CF\ of\ -1=-\|-1\|=1$ $CF\ of\ 2=\|2\|=2$ $\therefore\quad adj(A)=\begin{bmatrix}2&1\\1&2\end{bmatrix}$	OR	*Given equations* $2x+y=1;3x+2y=1$ $\Delta=\begin{vmatrix}2&1\\3&2\end{vmatrix}=4-3=1$ $\Delta_x=\begin{vmatrix}1&1\\1&2\end{vmatrix}=2-1=1$ & $\Delta_y=\begin{vmatrix}2&1\\3&1\end{vmatrix}=2-3=-1$ $x=\frac{\Delta_x}{\Delta}=\frac{1}{1}=1$ *and* $y=\frac{\Delta_y}{\Delta}=\frac{-1}{1}=-1$ $\therefore x=1$ & $y=-1$	5M
1(d)	$AB=\begin{bmatrix}1&2\\3&4\end{bmatrix}\begin{bmatrix}2&1\\3&4\end{bmatrix}$ $AB=\begin{bmatrix}2+6&1+8\\6+12&3+16\end{bmatrix}=\begin{bmatrix}8&9\\18&19\end{bmatrix}$ $(AB)^T=\left(\begin{bmatrix}8&9\\18&19\end{bmatrix}\right)^T=\begin{bmatrix}8&18\\9&19\end{bmatrix}$	OR	$\begin{vmatrix}x&2\\3&4\end{vmatrix}=\begin{vmatrix}3&2\\0&x\end{vmatrix}$ $4x-6=3x-0$ $4x-3x=6$ $x=6$	5M

Section-II			
2(a)	Given, slope = m = 5 Y - intercept = c = 3 Equation of st line is $y = mx + c$ $y = 5x + 3$ $5x + 3 = y$ $5x - y + 3 = 0$ **OR** $(a)\quad y - y_1 = m(x - x_1)$ $(b)\quad y - y_1 = \frac{y_2 - y_1}{x_2 - x_1}(x - x_1)$	4M
2(b)	$A = (3,4)$ and $B = (5,6)$ $y - y_1 = \frac{y_2 - y_1}{x_2 - x_1}(x - x_1)$ $y - 4 = \frac{6-4}{5-3}(x - 3)$ $y - 4 = \frac{2}{2}(x - 3)$ $y - 2 = 1(x - 3)$ $x - 3 - y + 2 = 0$ $x - y - 1 = 0$ **OR** $A(x_1, y_1) = (1,2)$ & $\theta = 45^0$ $m = \tan\theta = \tan 45^0 = 1$ $y - y_1 = m(x - x_1)$ $y - 2 = 1(x - 1)$ $y - 2 = x - 1$ $x - 1 - y + 2 = 0$ $x - y + 1 = 0$	6M
2(c)	$Given: x - 2y + 1 = 0$ & $2x + 6y - 5 = 0$ $m_1 = -\frac{a}{b} = -\frac{1}{-2} = \frac{1}{2}$ & $m_2 = -\frac{a}{b} = -\frac{2}{6} = -\frac{1}{3}$ $\tan\theta = \frac{m_1 - m_2}{1 + m_1 m_2}$ $\tan\theta = \left\lvert \frac{\frac{1}{2} - \left(-\frac{1}{3}\right)}{1 + \frac{1}{2}\left(-\frac{1}{3}\right)} \right\rvert = \left\lvert \frac{\frac{1}{2} + \frac{1}{3}}{1 - \frac{1}{6}} \right\rvert = \left\lvert \frac{\frac{3+2}{6}}{\frac{6-1}{6}} \right\rvert = \left\lvert \frac{\frac{5}{6}}{\frac{5}{6}} \right\rvert = 1$ $\Rightarrow \tan\theta = \tan 45^0$ $\therefore \theta = 45^0$ **OR** $Given\ lines\ 3x - 4y - 7 = 0$ $9x - 12y - 11 = 0$ $m_1 = -\frac{a}{b} = -\frac{3}{-4} = \frac{3}{4}$ $m_2 = -\frac{a}{b} = -\frac{9}{-12} = \frac{3}{4}$ $\therefore m_1 = m_2 = \frac{3}{4}$ Hence the given lines are parallel .	5M
2(d)	$Consider\ given line\ 5x + 6y - 10 = 0$ $slope\ of\ given line = -\frac{a}{b} = -\frac{5}{6}$ $\therefore Slope\ of\ required\ line = m = -\frac{5}{6}$ $A(x_1, y_1) = (-3,3)$ & $m = -\frac{5}{6}$ $y - y_1 = m(x - x_1)$ $y - 3 = -\frac{5}{6}(x - (-3))$ $6(y - 3) = -5(x + 3)$ $6y - 18 + 5x + 15 = 0$ $5x + 6y - 3 = 0$ **OR** Let x – intercept = a = k y – intercept = b = k $\frac{x}{a} + \frac{y}{b} = 1 \quad \Rightarrow \frac{x}{k} + \frac{y}{k} = 1 \quad \Rightarrow \frac{x+y}{k} = 1$ $x + y = k$ ------------(1) *Since* (1) *passes through* (–2,5) $-2 + 5 = k$ $k = 3$ *subtitute in equation* (1) $x + y = 3$ $x + y - 3 = 0$ *is the required equation of st line.*	5M

Section-III

Q	Answer		Alternative answer	Marks
3(a)	$120^0 = 120\times\frac{\pi}{180} = \frac{2\pi}{3}$ $\frac{3\pi}{2} = \frac{3\pi}{2}\times\frac{180}{\pi} = 270^0$	OR	$\sin(A+B) = \sin A\cos B + \cos A\sin B$ $put\ \ B = A$ $\sin(A+A) = \sin A\cos A + \cos A\sin A$ $\sin 2A = 2\sin A\cos A$ $Hence\ \ proved\ \ the\ \ result.$	4M
3(b)	$\tan(A+B) = \frac{\tan A+\tan B}{1-\tan A\tan B}$ $LHS = \tan(45^0+A)$ $= \frac{\tan 45^0+\tan A}{1-\tan 45^0\tan A}$ $LHS \ \ = \frac{1+\tan A}{1-\tan A} = RHA$	OR	$Given\ \tan A = \frac{5}{12} = \frac{opp}{Adj}$ $OA^2 = OB^2 + AB^2$ $r^2 = (-12)^2 + (-5)^2 = 144+25 = 169$ $r = \pm\sqrt{169} = \pm 13$ $r = 13 \quad Since\ \ Hyp\ is\ \ always\ \ positive$ $\sin A = \frac{Opp}{Hyp} = \frac{y}{r} = \frac{-5}{13} = -\frac{5}{13}$ $\cos A = \frac{Adj}{Hyp} = \frac{x}{r} = \frac{-12}{13} = -\frac{12}{13}$  	6M
3(c)	$\frac{\cos(360^0-A)\tan(360^0+A)}{\cot(270^0-A)\sin(90^0+A)}$ $= \frac{\cos A\times\tan A}{\tan A\times\cos A}$ $=1$	OR	$LHS = \frac{1-\cos 2A+\sin 2A}{1+\cos 2A+\sin 2A}$ $LHS = \frac{2\sin^2 A+2\sin A\cos A}{2\cos^2 A+2\sin A\cos A}$ $LHS = \frac{2\sin A(\sin A+\cos A)}{2\cos A(\cos A+\sin A)}$ $LHS = \frac{\sin A}{\cos A} = \tan A.$	5M
3(d)	$LHS = \cos 100^0 + \cos 80^0$ $\cos C+\cos D = 2\cos\left(\frac{C+D}{2}\right)\sin\left(\frac{C-D}{2}\right)$ $LHS = 2\cos\left(\frac{100+80}{2}\right)\cos\left(\frac{100-80}{2}\right)$ $LHS = 2\cos 90\times\cos 10$ $LHS = 2\times 0\times\cos 10$ $LHS = 0 = RHS$	OR	$L.H.S = \cos 20^0\cos 40^0\cos 80^0$ $= (\cos 40^0\cos 20^0)\cos 80^0$ $W.K.T\ \ \cos A\cos B = \frac{1}{2}[\cos(A+B)+\cos(A-B)]$ $L.H.S = \frac{1}{2}[\cos(40^0+20^0)+\cos(40^0-20^0)]\cos 80^0$ $= \frac{1}{2}(\cos 60^0+\cos 20^0)\cos 80^0$ $= \frac{1}{2}\left(\frac{1}{2}+\cos 20^0\right)\cos 80^0$ $= \frac{1}{4}\cos 80^0 + \frac{1}{2}\cos 80^0\cos 20^0$ $= \frac{1}{4}\cos(180-100^0)+\frac{1}{2}\times\frac{1}{2}[\cos(80^0+20^0)+\cos(80^0-20^0)]$ $= \frac{1}{4}\times-\cos 100^0 + \frac{1}{4}(\cos 100^0+\cos 60^0)$ $= -\frac{1}{4}\cos 100^0 + \frac{1}{4}\cos 100^0 + \frac{1}{4}\cos 60^0 = \frac{1}{4}\times\frac{1}{2} = \frac{1}{8} = R.H.S$	5M

Section-IV

4(a) (4M)

$$y = x^3 + 3\cos x + 4e^x + 2$$
$$\frac{dy}{dx} = 3x^2 + 3\times -\sin x + 4e^x + 0$$
$$\frac{dy}{dx} = 3x^2 - 3\sin x + 4e^x$$

OR

$$y = (x+1)(x-1)$$
$$y = x^2 - 1^2 = x^2 - 1$$
$$\frac{dy}{dx} = 2x - 0 = 2x$$

4(b) (6M)

$$y = 2x^3 - 15x^2 + 36x + 6$$
Differentiate w.r.t.x
$$\frac{dy}{dx} = \frac{d}{dx}\left(2x^3 - 15x^2 + 36x + 6\right)$$
$$\frac{dy}{dx} = 6x^2 - 30x + 36$$
$$0 = 6x^2 - 30x + 36$$
$$6x^2 - 30x + 36 = 0$$
Divide both side by 6
$$x^2 - 5x + 6 = 0$$
$$x^2 - 5x + 6 = 0$$
$$x^2 - 3x - 2x + 6 = 0$$
$$x(x-3) - 2(x-3) = 0$$
$$(x-3)(x-2) = 0$$
$$x - 3 = 0 \quad or \quad x - 2 = 0$$
$$x = 3 \quad or \quad x = 2$$
$x = 2,3$ are stationary points
$$\frac{dy}{dx} = 6x^2 - 30x + 36$$
Again diff w.r.t.x
$$\frac{d^2y}{dx^2} = 6\times 2x - 30 + 0$$
$$\frac{d^2y}{dx^2} = 12x - 30$$

When $x = 2$
$$\left(\frac{d^2y}{dx^2}\right)_{x=2} = 12(2) - 30 = 24 - 30 = -6 \prec 0$$
The function is maxima at $x = 2$ and its maximum value is given
$$y = 2x^3 - 15x^2 + 36x + 6$$
put $x = 2$
$$y_{max} = 2(2)^3 - 15(2)^2 + 36(2) + 6$$
$$y_{max} = 2(8) - 15\times 4 + 72 + 6$$
$$y_{max} = 16 - 60 + 72 + 6$$
$$y_{max} = 94 - 60 = 34$$
When $x = 3$
$$\left(\frac{d^2y}{dx^2}\right)_{x=3} = 12(3) - 30 = 36 - 30 = 6 \succ 0$$
Therfore the function is minima at $x = 3$ and its minimum value is given
$$y = 2x^3 - 15x^2 + 36x + 6$$
put $x = 3$
$$y_{min} = 2(3)^3 - 15(3)^2 + 36(3) + 6$$
$$y_{min} = 2(27) - 15\times 9 + 108 + 6$$
$$y_{min} = 54 - 135 + 108 + 6$$
$$y_{min} = 168 - 135 = 33$$

OR

$$s = t^3 - 2t^2 + 6t + 8$$
Differentiate w.r.t.t
$$\frac{ds}{dt} = \frac{d}{dt}\left(t^3 - 2t^2 + 6t + 8\right)$$
$$\frac{ds}{dt} = 3t^2 - 2\times 2t + 6 + 0$$
$$\frac{ds}{dt} = 3t^2 - 4t + 6$$
$$\frac{d^2s}{dt^2} = 3\times 2t - 4 + 0$$
$$\frac{d^2s}{dt^2} = 6t - 4$$
Acceleration at time t = 3sec
$$a = \frac{d^2s}{dt^2} = 6t - 4$$
$$a_{t=3\sec} = 6(3) - 4 = 18 - 4 = 14 \ meter/\sec$$

4(c)	$y = a\sin mx + b\sin mx$ *Differentiate w.r.t.x* $\frac{dy}{dx} = \frac{d}{dx}\left(a\sin mx + b\cos mx\right)$ $\frac{dy}{dx} = a \times \cos mx \times m + b \times -\sin mx \times m$ $\frac{dy}{dx} = am\cos mx - bm\sin mx$ *Again diff w.r.t.x* $\frac{d}{dx}\left(\frac{dy}{dx}\right) = \frac{d}{dx}\left(am\cos mx - bm\sin mx\right)$ $\frac{d^2y}{dx^2} = am \times -\sin mx \times m - bm \times \cos mx \times m$ $\frac{d^2y}{dx^2} = -am^2\sin mx - bm^2\cos mx =$ $\frac{d^2y}{dx^2} \quad -m^2\left(a\sin mx + b\cos mx\right)$ $\frac{d^2y}{dx^2} = -m^2 y \quad \text{From equation}(1)$ $\frac{d^2y}{dx^2} + m^2 y = 0$	OR	$y = \frac{1+\sin x}{1-\sin x}$ *Differentiate w.r.t.x* $\frac{dy}{dx} = \frac{d}{dx}\left(\frac{1+\sin x}{1-\sin x}\right)$ $w.k.t\ \frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2}$ $\frac{dy}{dx} = \left(\frac{(1-\sin x)\frac{d}{dx}(1+\sin x) - (1+\sin x)\frac{d}{dx}(1-\sin x)}{(1-\sin x)^2}\right)$ $\frac{dy}{dx} = \frac{(1-\sin x)(0+\cos x) - (1+\sin x)(0-\cos x)}{(1-\sin x)^2}$ $\frac{dy}{dx} = \frac{(1-\sin x)(\cos x) - (1+\sin x)(-\cos x)}{(1-\sin x)^2}$ $\frac{dy}{dx} = \frac{\cos x - \sin x\cos x + \cos x + \sin x\cos x}{(1-\sin x)^2}$ $\frac{dy}{dx} = \frac{2\cos x}{(1-\sin x)^2}$	5M
4(d)	$y = 1 - x^3$ *Differentiate w.r.t.x* $\frac{dy}{dx} = \frac{d}{dx}\left(1 - x^3\right)$ $\frac{dy}{dx} = 0 - 3x^2 = -3x^2$ $\left(\frac{dy}{dx}\right)_{at\ A(2,3)} = -3(2)^2 = -3 \times 4 = -12$ *Now* $A = (2,3)$ *and* $m = -12$ $y - y_1 = m\left(x - x_1\right)$ $y - 3 = -12\left(x - 2\right)$ $y - 3 = -12x + 24$ $y - 3 + 12x - 24 = 0$ $12x + y - 27 = 0$	OR	$y = \left(1 + x^2\right)\tan^{-1} x$ *Differentiate w.r.t.x* $\frac{dy}{dx} = \frac{d}{dx}\left[\left(1 + x^2\right)\tan^{-1} x\right]$ $w.k.t\ \frac{d}{dx}(uv) = u\frac{dv}{dx} + v\frac{du}{dx}$ $\frac{dy}{dx} = \left(1 + x^2\right)\frac{d}{dx}\left(\tan^{-1} x\right) + \tan^{-1} x\frac{d}{dx}\left(1 + x^2\right)$ $\frac{dy}{dx} = \left(1 + x^2\right) \times \frac{1}{\left(1 + x^2\right)} + \tan^{-1} x \times (0 + 2x)$ $\frac{dy}{dx} = 1 + 2x\tan^{-1} x$	5M

		Section-V		
5(a)	Let $I=\int \tan^2 x\,dx$ $W.K.T\ \tan^2 x=\sec^2 x-1$ $I=\int\left(\sec^2 x-1\right)dx$ $=\tan x-x+c$	OR	$I=\int\left(\sin x+\frac{1}{x}+x^3-7\right)dx$ $I=-\cos x+\log x+\frac{x^4}{4}-7x+c$	4M
5(b)	$Given: y=\left(x^2+2\right) and\ x=1, x=2$ W.K.T Area bounded by the curve with xiax is is $A=\int_a^b y\,dx$ $A=\int_1^2\left(x^2+2\right)dx=\left(\frac{x^3}{3}+2x\right)_1^2$ $A=\left(\frac{2^3}{3}+2\times2\right)-\left(\frac{1^3}{3}+2\times1\right)=\frac{8}{3}+4-\frac{1}{3}-2$ $A=\frac{8^{\times1}}{3}-\frac{1^{\times1}}{3}+2^{\times3}=\frac{8-1+6}{3}=\frac{13}{3}\,sq\,units$	OR	$Given: y^2=2x+1 and\ x=0, x=2$ W.K.T Volume generated by the curve with xiax is is $V=\pi\int_a^b y^2\,dx$ $V=\pi\int_0^2(2x+1)dx=\pi\left(2\times\frac{x^2}{2}+x\right)_0^2$ $V=\pi\left(x^2+x\right)_0^2=\pi\left\{\left(2^2+2\right)-\left(0^2+0\right)\right\}$ $V=\pi\{(4+2)-0\}=6\pi\ cubic\ units$	
5(c)	$I=\int x\sin x\ dx$ WKT $\int uv\,dx=u\int v\,dx-\int\left(\int v\,dx\times\frac{du}{dx}\right)dx$ $I=x\int \sin x\ dx-\int\left(\int \sin x\ dx\times\frac{d(x)}{dx}\right)dx$ $I=x\times-\cos x-\int(-\cos x\times1)dx$ $I=-x\cos x+\int\cos x\,dx$ $I=-x\cos x+\sin x+c$	OR	Let $I=\int_0^1\frac{\left(\tan^{-1}x\right)^4}{1+x^2}dx$ put $\tan^{-1}x=t$ $\frac{1}{1+x^2}=\frac{dt}{dx}\Rightarrow\frac{1}{1+x^2}dx=dt$ $x=0\Rightarrow t=\tan^{-1}0=0$ $\Rightarrow x=1\Rightarrow t=\tan^{-1}1=\frac{\pi}{4}$ $I=\int_0^{\frac{\pi}{4}}t^4\,dt=\left[\frac{t^5}{5}\right]_0^{\frac{\pi}{4}}=\frac{1}{5}\left[\left(\frac{\pi}{4}\right)^5-(0)^5\right]=\frac{1}{5}\left(\frac{\pi^5}{1024}-0\right)$ $I=\frac{\pi^5}{5120}$	
5(d)	Let $I=\int\frac{x+1}{x^2+2x+1}dx$ put $x^2+2x+1=t$ Diff w.r.t.x $2x+2+0=\frac{dt}{dx}\Rightarrow 2(x+1)dx=dt$ $(x+1)dx=\frac{dt}{2}$ $I=\int\frac{1}{t}\times\frac{dt}{2}==\frac{1}{2}\log t+c$ $I=\frac{1}{2}\log\left(x^2+2x+1\right)+c$	OR	Let $I=\int\sin^3 x\,dx$ $W.K.T\ \sin 3x=3\sin x-4\sin^3 x$ $\sin^3 x=\frac{1}{4}(3\sin x-\sin 3x)$ $I=\int\frac{1}{4}(3\sin x-\sin 3x)dx$ $=\frac{1}{4}\int(3\sin x-\sin 3x)+c$ $=\frac{1}{4}\left(-3\cos x-\times-\frac{\cos 3x}{3}\right)+c$ $=\frac{1}{4}\left(-3\cos x+\frac{\cos 3x}{3}\right)+c$	