a) (i) State Cauchy's root test

(ii) Test for the convergence of the series $\frac{2}{1} + \frac{2.5}{1.5} + \frac{2.5.8}{1.5.9} + \dots$

If $y = (x^2 - 1)^n$ then prove that $(1 - x^2)y_{n+2} - 2xy_{n+1} + n(n+1)y_n = 0$.

c) i) Obtain the Maclaurin's series expansion of $f(x) = \tan^{-1} x$ up to the terms containing x^2 ii) State Leibnitz theorem for the nth derivative of y=uv where u and v are differentiable

a) If $z=e^{ax+by}f(ax-by)$ then prove that $b\frac{\partial z}{\partial x}+a\frac{\partial z}{\partial y}=2abz$

b) If $u = \frac{yz}{x}$, $v = \frac{zx}{y}$, $w = \frac{xy}{z}$ then show that $\frac{\partial(u, v, w)}{\partial(x, y, z)} = 4$. Find the percentage error in the calculated value of the volume of a rectangular parallelopiped when errors of 2%,-1% and 1% are made in measuring the length, bread and height respectively.

If *u* is a homogeneous function of degree *n* in *x* and *y*, then prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = nu$

Hence deduce that $x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2} = n(n-1)u$.

Using Maclaurin's series expand $f(x,y) = e^{ax+by}$ upto second degree terms in x and y

If ho_1 and ho_2 are the radii of curvature at the extremities of any chord of the cardinal Find the maximum value of $x^2 + y^2 + z^2$ when x + y + z = 3a by Lagrange's multiplied Unit - IV

 $r = a(1 + \cos \theta)$ which passes through the pole, then show that $\rho_1^2 + \rho_2^2 = \frac{16a^2}{9}$.

Prove that the curves $r = a(1 + cos\theta)$ $r = b(1 - cos\theta)$ intersect each other orthogonal

With usual notations prove that $\rho = \frac{(1+y_1^2)^2}{2}$.

Verify Cauchy's mean value theorem for the functions $f(x) = \frac{1}{x^2}$, $g(x) = \frac{1}{x}$ in [a,b], b>a>0 State and prove Lagrange's mean value theorem.

Verify Rolle's theorem for the function $f(x) = log(\frac{x^2+12}{7x}) in [3, 4]$

Unit-V

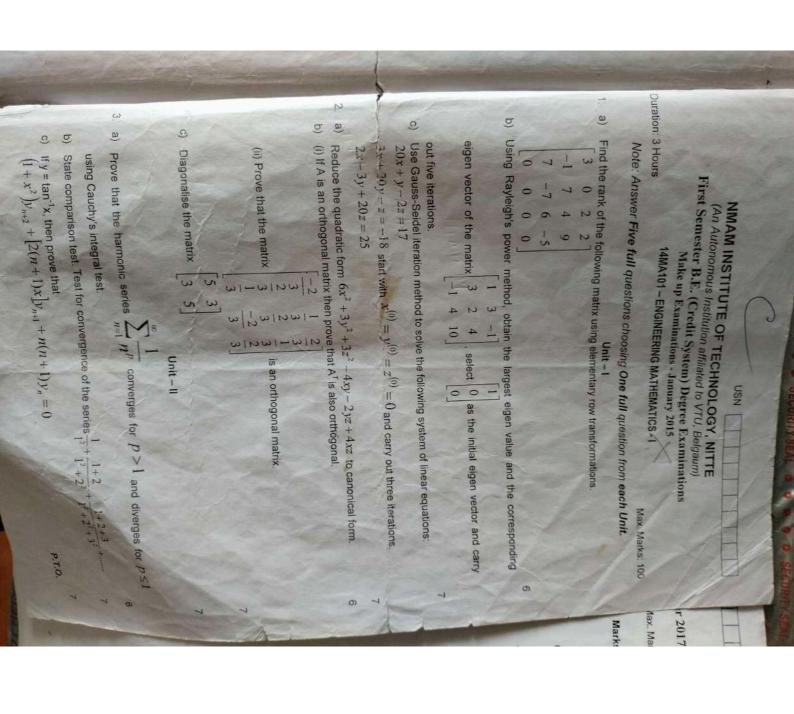
Obtain the reduction formula for $\int \cos^n x dx$. Hence evaluate $\int \cos^n x dx$.

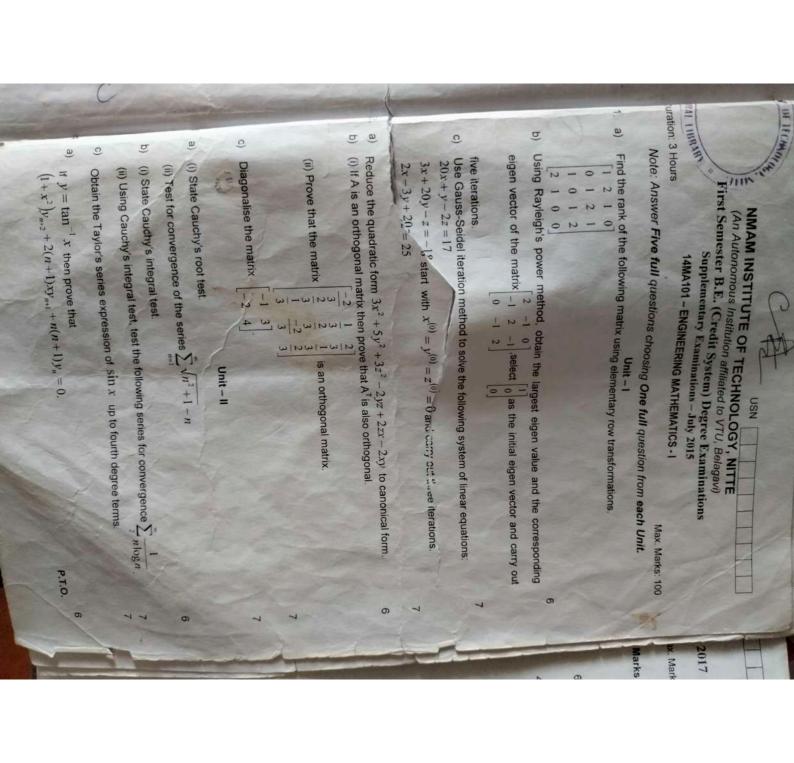
Find the surface area of the solid generated by revolving the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ about the x-axis. Trace the curve $r = a(1 + \cos \theta)$

10.

Find the volume of the solid generated by the revolution of the cardioid $r=a(1+\cos\theta)$ $\int \frac{x^2}{\sqrt{2\alpha x - x^2}} dx \quad ii) \int \sin^4 x \, dx,$

Find the area bounded by the parabola $y^2 = 4\alpha x$ and its latus rectum. ************





Bigom's Taxonomy, L* Level	a) Trace the curve x=acos ³ t, y=asin ³ t. b) Find the area included between the curve y ² (2a – x) = x ³ and its asymptote. c) Find the surface of the solid formed by revolving the cardioid r = a(1+cosθ) about the latter line.	ii) $\int_{0}^{2} \cos^{6}x dx$	c) Evaluate i) $\int_{0}^{s} \frac{x^{7}}{\sqrt{(a^{2}-x^{2})}} dx$	n is a positive integer. b) Find the length of the cardioid r=a(1+cosθ) also show that the upper half is bisected by θ=π/3	a) Obtain the reduction formula $\int \sin^n x dx$. Hence evaluate $\int_0^{\frac{\pi}{2}} \sin^n x dx$ where	Unit – V			$r=2a\cos\theta$ and $r=a(1-\cos\theta)$ and	State and prove Cauchys Mean value theorem. SEE - November - December 2015	_{15MA} 101
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(ii) $\frac{1}{1+2} + \frac{2}{1+2^2} + \frac{3}{1+2^3} + \dots \infty$

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a) (i) State Cauchy's root test

(ii) If $y = (\sin^{-1}x)^2$, show that $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - n^2y_n = 0$

b) Obtain the Maclaurin's series of $f(x) = e^{(\sin 2x)}$ upto terms containing x^3

(ii) Test for the convergence of the series $(\frac{1}{3})^2 + (\frac{1.2}{3.5})^2 + (\frac{1.2.3}{3.5.7})^2 + \dots \infty$

State Cauchy's integral test. Using Cauchy's integral test prove that $\sum_{1}^{\infty} \frac{1}{n^p}$

converges for p>1 and diverges for $p \le 1$.

(B) Obta

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a) State and prove the Euler's theorem. Verify Euler's theorem for the function $u = \sqrt{x^2 + y^2}$

Unit - III

If $x = e^{u}\cos v$, $y = e^{u}\sin v$ then find $J = \frac{\partial(x,y)}{\partial(u,v)}$ and $J' = \frac{\partial(u,v)}{\partial(x,y)}$

Hence show that JJ'=1.

Prove that, if the perimeter of a triangle is constant, the triangle has maximum area when it is equilateral.

If $u = \frac{e^{x+y}}{e^x + e^y}$ then show that $u_x + u_y = u$.

z = f(u, v) where $u = x^2 - y^2$, v = 2xy, prove that i) $x \frac{\partial z}{\partial x} - y \frac{\partial z}{\partial y} = 2(x^2 + y^2) \frac{\partial z}{\partial u}$

 $\left(\frac{\partial z}{\partial x}\right)^2 + \left(\frac{\partial z}{\partial y}\right)^2 = 4(x^2 + y^2) \left[\left(\frac{\partial z}{\partial u}\right)^2 + \left(\frac{\partial z}{\partial v}\right)^2\right].$

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Trace

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c) Expand the function $f(x,y)=x^y$ about the point (1,1) upto third degree terms.

Unit - IV

a) Show that radius of curvature at any point of the cardioid $r=a(1-\cos\theta)$ varies

