**Shri Shamrao Patil (Yadravkar) Educational & Charitable Trust's**

**Sharad Institute of Technology, College of Engineering, Yadrav**

# Yadrav (Ichalkaranji) (Approved by AICTE, Govt. of Maharashtra and Affiliated to Shivaji University, Kolhapur), Telephone: +91 (2322) 253000/01, Toll Free No. : 1800-233-1419, Fax: +91-2322-252897, **Web- www.sitcoe.org.in Email:** [contact@sitcoe.org.in](mailto:contact@sitcoe.org.in)

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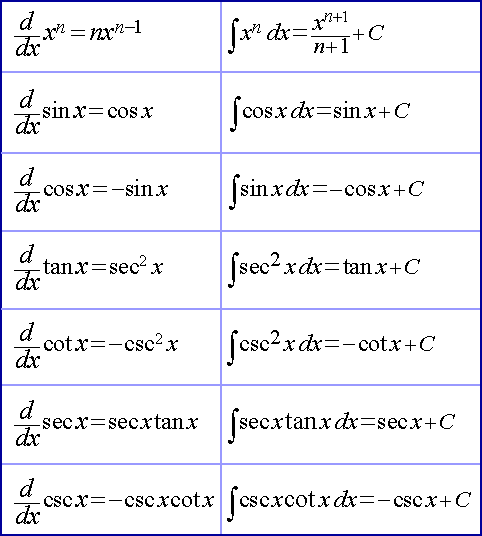
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***Department of Mechanical Engineering***

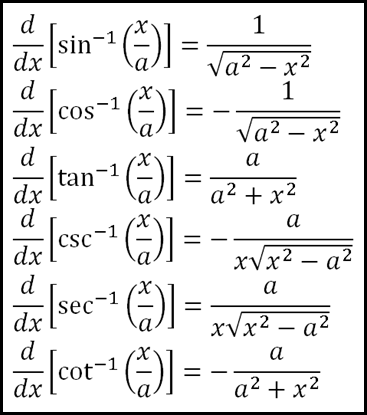
***Formulae List***

*Applied Numerical Methods*

**1) Derivative Formulae :-**



**2)** **INVERSE TRIGNOMETRIC FORMULAE:-**



**3) Integration Formulae:-**

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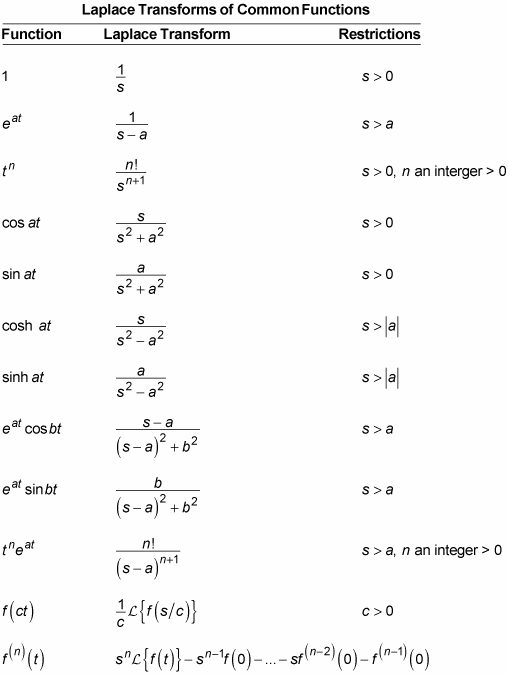
**4) Integrals of Exponential Functions:-**



**5)Integrals of** **Logarithmic Functions:-**



**6) Laplace Formulae :-**



Formula List:

Chapter 1.

A) Roots Of Equation:-

|  |  |  |
| --- | --- | --- |
| Sr.No | Method | Formula |
| 1 | Bisection Method | (a+b)/2 |
| 2 | Regula falsi Method/False possition Method | Xn+1=Xn-1- f(Xn-1)  X2=X0 - f(X0) |
| 3 | Newton Raphson Method | Xn+1=Xn-  X1=X0- |
| 4 | Multiple root by Newton method | Xn+1=Xn- *m*  X1=X0- |
| 5 | System of non-linear equation | f(x0,y0)+h\*(df/dx)x0,y0 + k\*(df/dy)x0,y0 = 0  g(x0,y0)+h\*(dg/dx)x0,y0 + k\*(dg/dy)x0,y0 = 0  X1=X0+h  Y1=Y0+k |
| 6 | Secant Method | Xn+1=Xn - f(Xn)  X2=X1  f(X1) |
| 7 | Muller’s Method | A=  B=  Xi+1=Xi- |

Chapter 2.

B) Linear Algebric Equation:-

|  |  |  |
| --- | --- | --- |
| Sr.No | Method | Formula |
| 1 | Gauss –Elimination Method(Traingularisation Method) | AX=B |
| 2 | Factorization Method(LU Decomposition Method) | AX=B  A=LU  LUX=B |
| 3 | Jacobi-iterative method | X=(d1-b1y-c1z) X0=Y0=Z0=0  Y=(d2-a2x-c2z)  Z=(d3-b3y-a3x) |
| 4 | Gauss-Seidal Method | X=(d1-b1y-c1z)  Y=(d2-a2x-c2z)  X=(d3-b3y-a3x) |

Chapter 3.

C) Curve-Fitting

|  |  |  |
| --- | --- | --- |
| Sr.No | Method | Formula |
| 1 | Linear -Regresion Method | Y=a+bx  £y=na+b£x  £xy=a£x+b£x2 |
| 2 | Polynomial -Regresion Method | Y=a+bx+cx2  £y=na+b£x+c£x2  £xy=a£x+b£x2+c£x3  £x2y=a£x2+b£x3+c£x4 |
| 3 | Lagrang’s Interpolation | Y=f(x)=  ++    +............ |
| 4 | Newton’s Divided Difference Method | Y=f(x)=y0+(x-x0)[x0,x1]+ (x-x0)(x-x1)[x0,x1,x2]+ (x-x0)(x-x1)(x-x2)[x0,x1,x2,x3]+.......... (x-x0)(x-x1)…….(x-xn)[x0,x1,x2,.....xn] |

Chapter 4.

D) Numerical Differentiation&Integration:-

|  |  |  |
| --- | --- | --- |
| Sr.No | Method | Formula |
| 1 | Trapezoidal Rule |  |
| 2 | Simpson’s 1/3rd Rule |  |
| 3 | Simpson’s 3/8th Rule |  |
| 5 | Gauss Quadrature  a)2-point gauss quadrature  b)3-point gauss quadrature | W1f(x1)+W2f(x2)    f(-1/)  W1f(x1)+W2f(x2)+W3f(x3)    f(0)+ [ f(-) +f() ] |

Chapter 5.

E) Ordinary Differential Equation:-

|  |  |  |
| --- | --- | --- |
| Sr.No | Method | Formula |
| 1 | Taylor Series Methd | Y=y0+(x-x0)y0’+ y0”+ y0’”+ y0””+……….. |
| 2 | Picard’s Method | Y=y0+ dx  Y1=y0+ dx |
| 3 | Euler’s Method | Y1=y0+h\*f(x0,y0)  Y2=y1+h\*f(x1,y1)  .  .  .  .yn+1=yn+h\*f(xn,yn) |
| 4 | Modified Euler’s Method | Y1(1)=y0+ [f(x0,y0)+ f(x1,y1)]  Y1(2)=y0+ [f(x0,y0)+ f(x1,y1(1))]  Y1(3)=y0+ [f(x0,y0)+ f(x1,y1(2))] |
| 5 | Runge-Kutta Method | K1=h\* f(x0,y0)  K2=h\* f(x0+,y0+)  K3=h\* f(x0+,y0+)  K4=h\* f(x0+h,y0+k3)  k= [K1+2K2+2K3+K4]  x=x0+h,y=y0+k |
| 6 | System Equations | K1=h\* f(x0,y0,z0)  l1=h\* φ(x0,y0,z0)  K2=h\* f(x0+,y0+ , z0+)  l2=h\* φ (x0+,y0+ , z0+)  K3=h\* f(x0+,y0+ , z0+)  l3=h\* φ (x0+,y0+ , z0+)  K4=h\* f(x0+h,y0+k3,z0+ l3)  l4=h\* φ(x0+h,y0+k3,z0+ l3)  k= [K1+2K2+2K3+K4]  l= [l1+2l2+2l3+l4]  x=x0+h,y=y0+k,z=z0+l |