# Agnihotri Engineering & GATE Classes

Scripting success stories

## UNIT-1 ST - ASSIGNMENT ON DIFFERENTIAL CALCULUS

**Q.1) Use MACLAURIANS THEOREM to solve following ?**

a) Find the value of A,B & C in the expansion of the function log (secx) = $Ax^2$ + B$x^4$ + C$x^6$

b) Expand the function f(x) = $log_e$ (1+x)

c) Find first four terms in expansion of function log(1+sinx) upto the term containing $x^4$

d) Expand the function f(x) = $log_e$ (1+$e^x$)

e) Expand $e^{sinx}$ upto the term containing $x^4$

f) Expand $e^x.cosx$

g) Expand $e^x.sinx$

h) Expand $\tan^{-1}x$ in ascending power of x

**Q.2) Use TAYLOR'S THEOREM to solve following ?**

a) Expand sinx in power of (x-$\frac{\Pi}{2}$)

b) Expand $2x^3+7x^2+x-1$ in power of (x-2)

c) Find the Taylor's series expansion of the function f(x)= log cosx about the point $\frac{\Pi}{3}$

d) Expand tan(x+$\frac{\Pi}{4}$) as far as the term $\mathbf{x^4}$ & evaluate tan46.5° upto four significant fig. digit

e) Expand $\log_e x$ in power of (x-1) & hence evaluate $\log_e(1.1)$ correct upto four decimal place

f) Compute the approximate value of $\sqrt{11}$ to four decimal places by taking the first five terms as an approximate Taylor's expansion

**Q.3) Use PARTIAL DIFFERANTIATION method to solve following** ?

a) Find all the partial differentiation coefficient of f(x,y)= xy +sin(x+y)

b) If $x^y+y^x = c$, Find $\frac{\partial y}{\partial x}$.

c) If u=xlogxy , where $x^3 + y^3 + 3xy = 1$, find $\frac{\partial u}{\partial x}$.

d) If u= $x^2 - y^2$ + sinyz, where $y = e^x$ and $z = \log_e x$, find $\frac{\partial u}{\partial x}$

e) If $u = \tan^{-1}\frac{y}{x} + \sin^{-1}\frac{x}{y}$ prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 0$

f) If $u = e^{xyz}$ then show that $\frac{\partial^3 u}{\partial x\,\partial y\,\partial z} = (1 + 3xyz + x^2y^2z^2)\,e^{xyz}$

**Q.4) Use EULER'S THEOREM to solve following ?**

a) If $u = \tan^{-1}\left(\frac{x^3+y^3}{x-y}\right)$ then show that

1) $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial x} = \sin 2u$

2) $x^2\frac{\partial^2 u}{\partial x^2} + y^2\frac{\partial^2 u}{\partial y^2} + 2xy\frac{\partial^2 u}{\partial x\,\partial y} = \sin 4u - \sin 2u$

b) If $u = \sin^{-1}\left(\frac{x^2+y^2}{x+y}\right)$, then show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial x} = \tan u$

c) If $u=\log\left(\frac{x^4+y^4}{x+y}\right)$ prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial x} = 3$

**Q.5) Use ERROR & APPROXIMATION concept to solve following ?**

a) Evaluate $\sqrt{99}$ approximately.

b) Evaluate cube root of 127(appx).

c) Find the percentage error in the area of an ellipse if 1% error is made in measuring the major and minor axes.

d) If H.P. is required to propel a steamer is proportional to cube of its velocity and square of its length , prove that 2% increase in velocity and 3% increase in length will require an approximately 12% increase in H.P.

e) The period T of a simple pendulum is given by $T=2\pi\sqrt{\frac{l}{g}}$. Find the maximum error in T due to possible errors upto 1% in I and 2.5% in g.

**Q.6) Use concept of MAXIMA & MINIMA for partial differentiation equation to solve following ?**

a) Discuss the maximum or minimum values of the function $f(x,y)=x^3 - 4xy + 2y^2$.

b) Discuss the maxima and minima of the function $x^3 + y^3 - 3axy$.

c) Discuss the maximum or minimum value of $u=x^3y^2(1 - x - y)$

d) Prove that the rectangular solid of maximum volume which can be inscribed in a sphere is a cube.

**Q.7) Use concept of TANGENT & NORMAL to solve following ?**

a) Find the equation of tangent at the point (2,2) on the curve $x^2 - 2xy + y^2 + 2x + y - 6 = 0$

b) Find the equation of tangent at the point ($a\cos\Theta$,$b\sin\Theta$)

**Q.8) Use concept of CENTER OF CURVATURE & RADIUS CURVATURE to solve following ?**

a)Find radius of curvature of $y = 4\sin x - \sin 2x$ at $x = \frac{\pi}{2}$

b)Find the coordinates of the center of curvature for the point (x,y) of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

c)Find the center of curvature at the point (1,-1) of the curve $y = x^3 - 6x^2 + 3x + 1$. Hence find the equation of the circle of curvature at this point?