DELHI TECHNICAL CAMPUS

B.TECH I SEM

APPLIED MATHEMATICS-I Paper CodeBS- 111

1. If u= log(tanx + tany + tanz) ,then prove that

$$sin2x\frac{\partial u}{\partial x}+sin2y\frac{\partial u}{\partial y}+sin2z\frac{\partial u}{\partial z}=2$$

2. If $u=\log(x^2+y^2+z^2)$, then prove that $x\frac{\partial^2 u}{\partial y\partial z}=y\frac{\partial^2 u}{\partial z\partial x}$
3. If $u=(x^2+y^2+z^2)$, where $x=e^t$, $y=e^t sint$, $z=e^t sint$, find $\frac{du}{dt}$. Ans. $4e^{2t}$
4. If $u=f\left(\frac{x}{y},\frac{y}{z},\frac{z}{x}\right)$, then prove that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}+z\frac{\partial u}{\partial z}=0$
5. If $u=sin(x^2+y^2)$ $and\ a^2x^2+b^2y^2=c^2$, then find $\frac{du}{dx}$.
   Ans. $2xcos(x^2+y^2)\left(1-\frac{a^2}{b^2}\right)$
6. Find the volume of the greatest rectangular parallelopiped that can be inscribed inside the ellipsoid $\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2}=1$ Ans. $\frac{8abc}{3\sqrt{3}}$
7. Show that the functions $u=x+y+z$, $v=x^3+y^3+z^3-3xyz$ and $w=x^2+y^2+z^2-xy-yz-zx$ are functionally dependent . find the relation between them. Ans. v=uw
8. Find the extreme values of sinx + siny + sin(x + y) ans. $\frac{3\sqrt{3}}{2}$
9. If x = uv and y = $\frac{u+v}{u-v}$, find $\frac{\partial(u,v)}{\partial(x,y)}$ Ans. $\frac{(u-v)^2}{4uv}$
10. Find the stationary value of $x^3+y^3-3axyz$ Ans. $f_{min}=-a^3$