SSR DEGREE AND PG COLLEGE(Autonomous)

Department of Mathematics

B.Sc II YEAR –Sem-III Important Questions

Unit wise important questions

Unit – I :

Long Questions :-

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

2) State and prove Euler's theorem on Homogeneous function

3) If $u = (x^2+y^2+z^2)^{-1/2}$; $x^2+y^2+z^2 \neq 0$. then show that

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2} = 0$$

4) If $Z = \frac{x^2+y^2}{x+y}$ then S.T, $\left(\frac{\partial Z}{\partial x} - \frac{\partial Z}{\partial y}\right)^2 = 4\left(1 - \frac{\partial Z}{\partial x} - \frac{\partial Z}{\partial y}\right)$

5) If $Z(x,y) = 3x^2y + 3xy^2$ then S.T $x\frac{\partial Z}{\partial x} + y\frac{\partial Z}{\partial y} = 3Z$

Short Questions :-

1) find the first order derivative of $Z = \tan^{-1}(x+y)$

2) Evaluate $\lim_{x \to 2} \frac{x^2-4}{x-2}$

3) find the value of the function $f(x,y) = x^2+y^2$ at the point $x=2,\ y=3$

4) If $u = \begin{vmatrix} x^2 & y^2 & z^2 \\ x & y & z \\ 1 & 1 & 1 \end{vmatrix}$ then S.T, $u_x + u_y + u_z = 0$

Unit – II :

Long Questions

1) Find $\frac{dZ}{dt}$. when $Z = xy^2 + x^2y$; $x = at^2$, $y = 2at$ verify by direct substitution

2) Expansion the function $f(x,y) = x^2 + xy + y^2$ and verify Taylor's theorem in powers $(x-2)$ & $(y-3)$

3) If $H = f(y-z, z-x, x-y)$. then prove that

$$\frac{\partial H}{\partial x} + \frac{\partial H}{\partial y} + \frac{\partial H}{\partial z} = 0$$

4) find the minimum value of $u = x^2+y^2+z^2$. when $ax+by+cz = p$

Short Questions :-

1) If $e^x + e^y = 2xy$ then find $\frac{dy}{dx} = \frac{-f_x}{f_y}$

2) Define Maxima and Minima of two functions

~~3) If $e^x + e^y = 2$~~

3) If $x^y = y^x$ then find $\left(\frac{dy}{dx}\right)$

Unit - III :-

Long Questions

1) find the Gradient of $f(x,y) = x^2y + 3xy^2 - 5x + y$ at the point $(1, 2)$

2) find the curl of the vector field $f = (x^2y)i + (yz^2)j + (3xz)k$

3) find the Divergence of the vector field $f = x^2y\,i + y^2z\,j + z^2x\,k$

Short questions (unit - III)

1) Solve $\int_0^1 \int_0^2 x \, dy \, dx$

2) find the curl of $F = (x, y, z)$

3) If $f = xi + yj + zk$ then find the divergence

Unit - IV :

Long questions

1) State and prove Gauss divergence theorem

2) State and prove Stoke's theorem

3) Verify stoke's theorem for $F = (z, x, y)$ over the triangle with vertices $(1,0,0)$, $(0,1,0)$ and $(0,0,1)$

Short questions

1) If $f = xi + yj + zk$. verify Gauss divergence theorem for $0 \le x, y, z \le 1$

2) find the value of $\int_S (F \times \nabla \phi) \cdot N \, ds$ where, $f = x^2 i + y^2 j + z^2 k$, $\phi = xy + yz + zx$'s' is the surface bounded by $x = \pm 1$, $y = \pm 1$ & $z = \pm 1$