SAPTHAGIRI NPS UNIVERSITY
BE 1st Semester 2024-25
Third Internal Assessment Test

Course Code: 24BEPHY102 **Semester: I**
Course: Linear Algebra and Calculus **SRN:**
Time: 90mins **Max Marks : 50**

PART –A

Answer any Ten of the following **2x10=20**

1. Define symmetric functions with examples.
2. If $u = 3x^2y + 6xy^2 + 7$ find $\frac{\partial u}{\partial x}$ and $\frac{\partial u}{\partial y}$.
3. If $f(x,y) = x^2y + 3xy^2$, find $\frac{\partial f}{\partial x}$ and $\frac{\partial f}{\partial y}$.
4. State Euler's theorem for homogeneous function of two variables.
5. Write the total derivative formula for the function $u = f(x,y)$ where, $x = x(t)$ and $y = \mathrm{y}(t)$.
6. If $z = u^2 + v^2, u = at$ and $v = 2at$. Find $\frac{dz}{dt}$.
7. Write the formula for Jacobian $J\left[\frac{u,v,w}{x,y,z}\right]$.
8. If $u = x + y, v = x - y$, find $J\left[\frac{u,v}{x,y}\right]$.
9. Evaluate $\int_{y=0}^{2}\int_{x=0}^{1} xy\, dx\, dy$.
10. Evaluate $\int_{0}^{1}\int_{1}^{2}(x+3)\, dx\, dy$.
11. Find the value of $\int_{0}^{1}\int_{0}^{x}(2x+y)\, dy\, dx$.
12. Evaluate $\int_{2}^{1}\int_{0}^{1}(y+4)\, dy\, dx$.

PART –B

Answer any Four of the following **5 x 4 =20**

1. If $u = e^{ax-by}\sin(ax+by)$, show that $b\frac{\partial u}{\partial x} - a\frac{\partial u}{\partial y} = 2abu$.
2. If $u = sin^{-1}\left(\frac{x^2+y^2}{x+y}\right)$, show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = tanu$.
3. If $u = x^2 + y^2 + z^2, v = xy + yz + zx, w = x + y + z$,find $\frac{\partial(u,v,w)}{\partial(x,y,z)}$.
4. Evaluate $\int_{0}^{1}\int_{0}^{x}(x^2+y^2)\, dy\, dx$.
5. Evaluate $\int_{1}^{2}\int_{0}^{2-y} xy\ dx\, dy$.

PART – C

Answer any One of the following **10 x 1=10**

1. If $u = log\left(\frac{x^2+y^2}{x+y}\right)$, show that $xu_x + yu_y = 1$.
2. If $u = x + 3y^2 - z^3, v = 4x^2yz,\ w = 2z^2 - xy$ find $\frac{\partial(u,v,w)}{\partial(x,y,z)}$ at (1, -1,0).