Vector Integration

Question Bank
Engineering Mathematics-IV (B.tech)

1. Evaluate : $\int_C F\,dr$ where $F=2x\,i+4y\,j-3zk$ and C is the curve

   $r=cost\,i+sint\,j+t\,k$

   from $t=0¿t=\pi$.

2. Verify Greens-theorem for $\int_C ¿ \begin{matrix} xy+y^2 \\ (¿)dx+x^2\,dy \end{matrix}$ where C is the boundary bounded by

   $y=x\wedge y=x^2$.

3. If $M(x,y),N(x,y)$ and their partial derivatives are continuous in some region R of xy plane bounded by a closed curve C then $\int_C ¿ = \iint ¿ S¿ \left(\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y}\right)dxdy$ ……..

4. Evaluate : $\int_C F\,dr$ over the circular path $x^2+y^2=a^2$ where $F=siny\,i+x(1+cosy)\,j.$

5. Evaluate: $\int_C (y^2+2xy)dx+(x^2-2xy)dy,$ where C is the boundary of the region $y=x^2$ and $x=y^2$.

6. Verify Greens-theorem for $\int_C (2y^2\,dx+3xdy)$ where C is the boundary bounded by

   $y=x\wedge y=x^2$.

7. Evaluate: $\int_C F\,dr$ where $F=(y^3\,i-x^3\,j)$ over $x^2+y^2=a^2$ in xy plane.

8. Evaluate: $liint¿S¿(x^3\,i+y^3\,j+z^3\,k)ds$ where $x^2+y^2+z^2=16$.

9. Apply stokes theorem for $\int_C (x^2+y-4)dx+3xydy+(2xz+z^2)$ over the surface of the hemisphere $x^2+y^2+z^2=16$.

10. Find the work done in moving a particle once round the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ in the plane $z=0$

In the force field given by $F=(3x-2y)i+(2x+3y)j-y^2k$.

11. If S is any closed surface enclosing a volume V and if : $F=axi+byj+czk$ then prove that $liint¿S¿ F\,n\,ds=(a+b+c)V$.

12. Verify stokes theorem for $F=(2xy+z^3)i+x^2j-3z^2xk$ over an enclosed surface of cylinder $x=a\cos\theta, y=a\sin\theta$ bounded by the plane $z=0$ and open at top $z=h.$

13. Evaluate : $\int_C F\,dr$, $F=yzi+xzj+xyk$ where C is the intersection of $x^2+y^2=1$ and $z=y^2$.

14. Apply stokes theorem to evaluate , $\oint_C ydx+zdy+xdz$,C is the intersection of $x^2+y^2+z^2=a^2$ and $x+z=a.$

15. Find the total work done in moving a particle in a field of force given by $F=3xyi-5zj+10zk$

Along the curve $r=t\,i+(t^2+1)j+t^3k$ from (0 , 1 ,0) to (2 , 5 , 8).

16. Evaluate : $\oint_C F\,dr$ by stokes theorem where $F=y^2i+x^2j-(x+z)k$ and C is the boundary of the triangle with vertices (0,0,0), (1,0,0) and (1,1,0).

17. Evaluate : $\int_C F\,dr$ for $F=3x^2i+(2xz-y)j+zk$ along the following paths:

(i) The straight line joining (0,0,0) to (2,1,3).
(ii) The curve $x=2t^2, y=t, z=4t^2-t$ from $t=0¿t=1.$

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