



## PART B



- Find the Values of 'a' and 'b' so that the surfaces  $ax^3 - by^2z = (a+3)x^2$  and  $4x^2y - z^3 = 11$  may cut orthogonally at  $(2, -1, -3)$ .
- Prove  $\vec{F} = (y^2 \cos x + z^3)\vec{i} + (2y \sin x - 4z)\vec{j} + 3xz^2\vec{k}$  is irrotational and find its scalar potential  $\phi$ .
- Show that  $\vec{F} = (6xy + z^3)\vec{i} + (3x^2 - z)\vec{j} + (3xz^2 - y)\vec{k}$  is Irrotational vector and the scalar potential function  $\phi$  Such that  $\vec{F} = \nabla\phi$ .
- Find the constants a,b and c so that  $\vec{F}$  may be irrotational Where  $\vec{F} = (axy + bz^3)\vec{i} + (3x^2 - cz)\vec{j} + (3xz^2 - y)\vec{k}$  and for these values of a,b,c find the scalar potential of  $\vec{F}$ .
- If  $\vec{F} = (3x^2 + 6y)\vec{i} + 14yz\vec{j} + 20xz^2\vec{k}$ , evaluate  $\int_C \vec{F} \cdot d\vec{r}$  from  $(0,0,0)$  to  $(1,1,1)$  over the curve  $x = t, y = t^2, z = t^3$ .
- Find the work done when a force  $\vec{F} = (y+3)\vec{i} + xz\vec{j} + (yz-x)\vec{k}$ , moves a particle from  $(0,0,0)$  to  $(2,1,1)$  along the curve  $x = 2t^2, y = t, z = t^3$ .
- Evaluate  $\iint_S \vec{F} \cdot \vec{n} ds$  where  $\vec{F} = 18z\vec{i} - 12z\vec{j} + 3y\vec{k}$  as S is the part of the plane  $2x + 3y + 6z = 12$  Which is in the first octant?
- Verify Green's theorem in the plane for  $\int (3x^2 - 8y^2)dx - (4y - 6xy)dy$  where C is The boundary of the region defined by  $x = y^2, y = x^2$ .

9. Evaluate by Green's theorem,  $\int_C (e^{-x} \sin y dx + \cos y dx)$  C being the rectangle

with vertices  $(0,0)$ ,  $(\pi,0)$ ,  $(\pi, \pi/2)$  and  $(0, \pi/2)$ .

10. State Green's theorem. Verify the theorem for  $\oint_C (xy^2 - 2xy)dx + (x^2y + 3)dy$

around of C of the region enclosed by  $y^2 = 8x$  and  $x = 2$ .

11. Apply Green's theorem in the plane to evaluate  $\oint_C (3x^2 - 8y^2)dx + (4y - 6xy)dy$

Where C is the boundary of the region enclosed by  $y = \sqrt{x}$  and  $y = x^2$ .

12. Evaluate  $\int [(2xy - x^2)dx - (x + y^2)dy]$  using Green's theorem where C is the

Closed curve formed by  $x = y^2$ ,  $y = x^2$ .

13. Verify Green's theorem in the plane for  $\int (xy + y^2)dx - x^2dy$  where C is the

boundary of the common area between  $y = x^2$ ,  $y^2 = x$ .

14. Verify Green's theorem in the plane for  $\int (xy + y^2)dx - x^2dy$  where C is the

boundary of the common area between  $y = x^2$ ,  $y = x$ .

15. Apply Green's theorem in the plane to evaluate  $\oint_C (3x^2 - 8y^2)dx + (4y - 6xy)dy$

where C is the boundary of the region defined by  $x=0$ ,  $y=0$  and  $x + y = 1$ .

16. Verify Gauss divergence theorem for  $\vec{F} = (x^2 - yz)\vec{i} + (y^2 - zx)\vec{j} + (z^2 - xy)\vec{k}$  taken Over the rectangular parallelepiped  $0 \leq x \leq a, 0 \leq y \leq b, 0 \leq z \leq c$ .
17. Verify Gauss divergence theorem for the function  $\vec{F} = y\vec{i} + x\vec{j} + z^2\vec{k}$  where S is the surface of the cuboids formed by the planes  $x=0, x=1, y=0, y=2, z=0, z=3$ .
18. Verify Gauss divergence theorem for the function  $\vec{F} = 4xz\vec{i} - y^2\vec{j} + yz\vec{k}$  over the cube  $x=0, x=1, y=0, y=1, z=0, z=1$ .
19. Verify divergence theorem for  $\vec{F} = 4xz\vec{i} - y^2\vec{j} + yz\vec{k}$  when S is the closed surface of the Cube formed by  $x=0, x=1, y=0, y=1, z=0, z=1$
20. Evaluate by Stoke's theorem  $\int_C \vec{F} \cdot d\vec{r}$  where  $\vec{F} = \sin z\vec{i} - \cos x\vec{j} + \sin y\vec{k}$  where C is the boundary of the common area between  $y = x^2, y = x$ .
21. Verify Stokes's theorem for  $\vec{F} = (x^2 + y^2)\vec{i} - 2xy\vec{j}$  taken around the rectangle bounded by the lines  $x = \pm a, y = 0, y = b$ .
22. Verify Stoke's theorem for  $\vec{F} = (y - z + 2)\vec{i} + (yz + 4)\vec{j} - xz\vec{k}$  over the open surfaces of the cube  $x=0, y=0, z=0, x=1, y=1, z=1$  not included in the XOY plane.
23. Verify Stoke's theorem for a vector defined by  $\vec{F} = (x^2 - y^2)\vec{i} + 2xy\vec{j}$  in the rectangular region in the XOY plane obtained by the lines  $x=0, x=a, y=0$  and  $y=b$ .