PART B

1. 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).**

2. Prove $\vec{F} = (y^2\cos x + z^3)\vec{i} + (2y\sin x - 4)\vec{j} + 3xz^2\vec{k}$ **is irrotational and find its scalar potential** φ**.**

3. 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** ϕ **Such that** $\vec{F} = \nabla\varphi$**.**

4.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** $\vec{F}$**.**

5. If $\vec{F} = (3x^2 + 6y)\vec{i} + 14yz\,\vec{j} + 20xz^2\vec{k}$ **,evaluate** $\int_C F.\overline{dr}$ **from (0,0,0) to (1,1,1) over the curve** $x = t$, $y = t^2$, $z = t^3$.

6.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** $x = 2t^2$, $y = t$, $z = t^3$.

7. Evaluate $\iint_S \vec{F}.\vec{n}ds$ **where** $\vec{F} = 18z\vec{i} - 12\vec{j} + 3y\vec{k}$ **as S is the part of the plane** $2x + 3y + 6z = 12$ **Which is in the first octant?**

8. 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) ,(π,0),(π, π/2) and (0, π/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 $0 \le x \le a, 0 \le y \le b, 0 \le z \le c$.

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 $\int_C \vec{F}.d\vec{r}$ 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 $\vec{F}=(y-z+2)\hat{i}+(yz+4)\hat{j}-xz\hat{k}$ 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.