DIC Practice Questions for Minor – II

1. Evaluate $\iint_R dxdy$ where R is the parallelogram in the xy-plane with vertices (1,0), (3,1), (2,2) and (0,1) by using transformation u = x + y and v = x – 2y.
2. Find the volume of the surface in first octant and bounded by $2x+3y+4z=12$.
3. Evaluate $\iiint (x^2+y^2+z^2)dxdydz$ taken over the volume enclosed by the sphere $x^2+y^2+z^2=1$ by changing into spherical polar coordinates.
4. Evaluate (a) $\int_0^1\int_1^2\int_2^3 (x+y+z)\,dxdydz$. (b) $\int_{-1}^1\int_0^z\int_{x-z}^{x+z} (x+y+z)\,dxdydz$
5. a. Find constants a, b, c so that the vector $\overline{F}=(x+2y+az)\ i+(b\,x-3y-z)\ j+(4x+cy+2z)\ k$ is irrotational.

   b. Prove that $r^n\overline{r}$ is Solenoidal if n=-3.
6. Prove that $\overline{F}=(2xyz^2)\overline{i}+(x^2z^2+z\cos yz)\overline{j}+(2x^2yz+y\cos yz)\overline{k}$ is conservative. Find its scalar potential.
7. Find directional derivative of the function $f=4xy^2+2x^2yz$ at the point P (1, 2, 3) in the direction of PQ where Q (5, 0, 4).
8. Find the angle between the surfaces $x^2+y^2+z^2=9$ and $z=x^2+y^2-3$ at the point (2, -1, 2).
9. If $\overline{f}=(x^2+y^2)i-2xyj$, evaluate $\int_c \overline{f}.\overline{dr}$ where C is the rectangle in xy-plane bounded by x=0, x=a, y=0, y=b.
10. Evaluate $\iint_s \overline{F}.\hat{n}ds$ where $\overline{F}=z\ \overline{i}\ +x\overline{j}-3y^2z\ \overline{k}$ and S is the surface of the cylinder $x^2+y^2=16$ included in the first octant between z=0 and z=5.
11. Verify Green's theorem for $\int_c (xy+y^2)dx+x^2dy$ Where C is bounded by $y=x$ and $y=x^2$.
12. Verify Green's theorem for $\int_c (2xy-x^2)dx+(x^2+y^2)dy$ Where C is bounded by $x=y^2$ and $y=x^2$
13. Verify Gauss theorem for $\overline{f}=4xzi-y^2j+yzk$ taken over the surface of the cube bounded by x=0, x=a, y=0, y=a, z=0, z=a.
14. Verify Gauss Divergence theorem for the function $\overline{F}=4x\overline{i}-2y^2\overline{j}-z^2\overline{k}$ taken over the surface bonded by the cylinder $x^2+y^2=4$, $z=0$ and $z=3$.
15. Verify Stoke's theorem for $\overline{F}=(2x-y)\overline{i}-yz^2\overline{j}-y^2z\overline{k}$ over upper half of the surface of the sphere $x^2+y^2+z^2=1$ bounded by the projection in xy-plane.
16. Evaluate $\int curl\overline{f}\cdot\hat{n}ds$ where $\overline{f}=(x^2+y-4)\overline{i}+3xy\overline{j}+(2xz+z^2)\overline{k}$, where S is the surface of the semi sphere $x^2+y^2+z^2=16$ above the xy-plane.