Unit 4
Complex Integration

1. Evaluate $\int_c \frac{z}{(z-1)^2(z+1)}dz$ where c is the circle $|z|=\frac{1}{2}$
2. Using Cauchy's Integral formula, evaluate $\int_c \frac{\sin \pi z^2 + \cos \pi z^2}{(z-2)(z-3)}dz$,where c is the circle |z|=4.
3. Expand $f(z)=\sin z$ in a Taylor's series about $z=\frac{\pi}{4}$.
4. Expand $\frac{z-1}{z+2}$ in Taylor Series about the Point z=1.
5. Explain the Laurent's series expansion of $f(z)=\frac{z}{(z+1)(z+2)}$ in the following region: $(i)\ |z|<1 \quad (ii)\ 1<|z|<2 \quad (iii)\ |z|>2$
6. Find the Laurent's Series expansion of f (z) = $\frac{1}{z^2+3z+2}$ in the region 1<|z|<2.
7. Evaluate $\int_{|z|=3} \frac{\sin \pi z^2 + \cos \pi z^2}{(z+1)(z+2)}dz$,using Cauchy's residue theorem.
8. . Find Laurent's series expansion of $f(z)=\frac{7z-2}{z(z-2)(z+1)}$ in 2<|z|<3.
9. Find the residue of $\frac{z+2}{(z+1)^2(z-2)}$ at its poles.
10. Obtain the residue of the function f (z) = (z-3) / (z+1) (z+2) at its pole.