	SRM Institute of Science and Technology Kattankulathur **DEPARTMENT OF MEATHEMATICS** **18MAB102T ADVANCED CALCULUS & COMPLEX ANALYSIS** **UNIT - V :** **Taylor's & Laurent' series, Singularity, Poles and Residue** **Tutorial Sheet 14**	
Sl.No.	**Questions**	**Answer**
	Part – A	
1	Find the Taylor's series expansion of $f(z)=\dfrac{z+3}{(z-1)(z-4)}$ about $z=2$ and also determine the region of convergence.	$\sum_{n=0}^{\infty}\left\{\frac{4}{3}(-1)^{n+1}-\frac{7}{6}.\frac{1}{2^n}\right\}(z-2)^n$
2	Obtain the series for $\dfrac{1}{z-3}$ valid in (i)$\lvert z\rvert<3$,(ii)$\lvert z\rvert>3$.	(i) $-\frac{1}{3}\sum_{n=0}^{\infty}\left(\frac{z}{3}\right)^n$ (ii) $\frac{1}{z}\sum_{n=0}^{\infty}\left(\frac{3}{z}\right)^n$
3	Expand $f(z)=\dfrac{z}{(z-1)(z-3)}$ as Laurent's series valid in the region $1<\lvert z\rvert<3$	$-\frac{1}{2z}\sum_{n=0}^{\infty}\left(\frac{1}{z}\right)^n-\frac{1}{2}\sum_{n=0}^{\infty}\left(\frac{z}{3}\right)^n$
4	Find the residues of $\dfrac{e^z}{z^8}$.	$\frac{1}{7!}$
5	Find the residue of $\dfrac{1-\cos(z)}{z^3}$.	1
	Part – B	
6	Find the Laurent's series of $f(z)=\dfrac{1}{z(1-z)}$ valid in the region (i)$\lvert z+1\rvert<1$,(ii)$\lvert z+1\rvert>2$.	(i) $-\sum_{n=0}^{\infty}(z+1)^n+\frac{1}{2}\sum_{n=0}^{\infty}\left(\frac{z+1}{2}\right)^n$ (ii) $\sum_{n=1}^{\infty}\frac{1}{(z+1)^n}-\frac{1}{(1+z)}\sum_{n=0}^{\infty}\left(\frac{2}{z+1}\right)^n$
7	Find the Laurent's series of $f(z)=\dfrac{z}{(z^2+1)(z^2+4)}$ in the region $1<\lvert z\rvert<2$.	$\frac{1}{3z}\sum_{n=0}^{\infty}(-1)^n\left(\frac{1}{z^2}\right)^n-\frac{z}{12}\sum_{n=0}^{\infty}(-1)^n\left(\frac{z^2}{4}\right)^n$
8	Find the residue at $z=0$ for $f(z)=\dfrac{1+e^z}{\sin z+z\cos z}$ and $f(z)=\dfrac{1}{z^2e^z}$	1,-1
9	Find the residue at each pole of $f(z)=\dfrac{z^2}{(z-1)^2(z+2)}$.	$\frac{4}{9},\frac{5}{9}$
10	Find the residue at $z=0$ for $\operatorname{cosec}^2 z$	0