SRM Institute of Science and Technology
Kattankulathur

DEPARTMENT OF MEATHEMATICS

18MAB102T ADVANCED CALCULUS & COMPLEX ANALYSIS

UNIT - V :
Complex Integration
Tutorial Sheet
13

Sl.No.	Questions	Answer
	Part – A	
1	Evaluate $\oint_C \frac{e^{-z}}{z-1}dz$ where C is a circle (i) $\lvert z\rvert = 2$ (ii) $\lvert z\rvert = \frac{1}{4}$.	(i) $2\pi i e^{-1}$ (ii) 0
2	Evaluate $\oint_C \frac{dz}{z^2-2z}$ where C is a circle $\lvert z-2\rvert = 1$.	πi
3	Evaluate $\oint_C z^2.e^{\frac{1}{z}}\,dz$ where C is the circle $\lvert z\rvert = 1$.	$\frac{\pi i}{3}$
4	Obtain Taylor's series of $f(z) = \frac{z-1}{z^2}$ in powers of $z-1$.	$\sum_{n=1}^{\infty}(-1)^{n-1}n(z-1)^n$
5	Obtain Laurent's series of $f(z) = \frac{1}{z(z-1)}$ in $\lvert z\rvert < 1$ and $\lvert z\rvert > 1$.	(i) $-\frac{1}{z}-\sum_{n=0}^{\infty}z^n$ (ii) $-\frac{1}{z}+\sum_{n=1}^{\infty}\left(\frac{1}{z}\right)^n$
	Part – B	
6	Evaluate $\oint_C \frac{\cos \pi z^2}{(z-1)(z-2)}dz$ where C is the circle $\lvert z\rvert = \frac{3}{2}$.	$2\pi i$
7	Evaluate $\oint_C \frac{z+4}{z^2+2z+5}dz$ where C is the circle $\lvert z+1+i\rvert = 2$.	$\frac{\pi}{2}(2i-3)$
8	Expand $\frac{1}{(z-1)(z-2)}$ in the region $0 < \lvert z-1\rvert < 1$	$-\frac{1}{z-1}-\sum_{n=0}^{\infty}(z-1)^n$
9	Expand $\frac{7z-2}{(z+1)z(z-2)}$ in the region $1 < \lvert z+1\rvert < 3$	$\frac{-2}{z+1}+\sum_{n=2}^{\infty}\frac{1}{(z+1)^n}-\frac{2}{3}\sum_{n=0}^{\infty}\left(\frac{z+1}{3}\right)^n$
10	Represent the function $\frac{4z+3}{z(z-3)(z+2)}$ in Laurent's series (i) Within $\lvert z\rvert = 2$ (ii) in the annular region between $\lvert z\rvert = 2$ and $\lvert z\rvert = 3$ and (iii) exterior to $\lvert z\rvert = 3$.	(i) $\frac{z^{-1}}{2}-\frac{5}{3}\sum_{n=0}^{\infty}\left(\frac{z}{3}\right)^n-\frac{1}{4}\sum_{n=0}^{\infty}(-1)^n\left(\frac{z}{2}\right)^n$ (ii) $\frac{z^{-1}}{2}-\frac{5}{3}\sum_{n=0}^{\infty}\left(\frac{z}{3}\right)^n-\frac{1}{2z}\sum_{n=0}^{\infty}(-1)^n\left(\frac{2}{z}\right)^n$ (iii) $\frac{z^{-1}}{2}-\frac{5}{z}\sum_{n=0}^{\infty}\left(\frac{3}{z}\right)^n-\frac{1}{2z}\sum_{n=0}^{\infty}(-1)^n\left(\frac{2}{z}\right)^n$