UNIT-4 **COMPLEX INTEGRATION**

PART B

1. Using Cauchy's Integral formula, evaluate $\int_c \frac{(z+4)dz}{(z^2+2z+5)}$,where c is the circle |z+1+i|=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. Evaluate $\int_c \frac{zdz}{(z-2)}$,where c is the circle |z-2|=3/2, by using Cauchy's integral formula.

4. Using Cauchy's Integral formula, evaluate $\int_c \frac{zdz}{(z-1)(z-2)^2}$,where c is the circle |z-2|=1/2.

5. Evaluate $\int_c \frac{dz}{(z-3)^2}$,where c is the circle |z|=1.

6. Evaluate $\frac{1}{2\pi i}\int_c \frac{z^2+5}{z-3} dz$ where c is |z|=4,using Cauchy Integral formula.

7. Use residue theorem to evaluate $\int \frac{3z^2+z-1}{(z^2-1)(z-3)} dz$ around the circle |z|=2.

8. Evaluate $\int_c \frac{z-2}{z(z-1)} dz$ where c is the circle |z|=3.

9. Find the residue of $\frac{z+2}{(z+1)^2(z-2)}$ at its poles.

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10. Obtain the residue of the function f (z) = (z-3) / (z+1) (z+2) at its pole.

11. Evaluate $\int_{|z|=3} \frac{\sin \pi z^2 + \cos \pi z^2}{(z+1)(z+2)} dz$,using Cauchy's residue theorem.

12. Determine the residues at poles of the function f (z) = (z+4) / (z-1) (z-2).

13. Evaluate $\int_C \frac{2}{(z-1)(z+3)} dz$,where c is |z-1|=2.

14. Evaluate $\int_c \frac{zdz}{(z-1)^2(z+1)}$ where c is |z| =2.

15. Evaluate $\int_c \frac{z^2+1}{(z^2-1)} dz$,where c is the circle |z-i|=1.

16. Evaluate $\int_c \frac{e^z dz}{(z^2+\pi^2)^2}$,where c is the circle |z|=4 by using Cauchy's residue theorem.

17. Expand $\frac{z-1}{z+2}$ in Taylor Series about the Point z=1.

18. Find the Laurent's Series expansion of f (z) = $\frac{z}{(z^2+1)(z^2+4)}$ in the region 1<|z|<2.

19. Find the Laurent's Series expansion of f (z) = $\frac{1}{z^2+3z+2}$ in the region 1<|z|<2.

20. Obtain the Laurent's series expansion of f (z) = 4z / (z^2-1) (z-4) in the region

2<|z-1|<3 and |z-1|>4 .

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21. Expand $f(z)=\frac{z^2-1}{(z+2)(z+3)}$ in a Laurent's series for 2<|z|<3.

22. Find the Laurent's series expansion of f(z)=1/(z-z^2) in the region

    1<|z+1|<2 and |z+1|>2.

23. Find the Laurent's series expansion of f(z)=e^{2z}/(z-1)^3 about z=1.

24. Find Laurent's series expansion of $\frac{z-1}{(z+2)(z+3)}$ valid in the region 2<|z|<3.

25. Find Laurent's series expansion of $f(z)=\frac{7z-2}{z(z-2)(z+1)}$ in 2<|z|<3.

26. Expand $\frac{1}{z(z-1)}$ as Laurent's series about z=0 in the annulus 0<|z|<1.

27.Expand into Laurent's series expansion of $\frac{z^2-1}{(z+2)(z+3)}$ in |z|<2.

28. Evaluate $\int_0^{2\pi}\frac{\cos 2\theta}{(5-4\cos\theta)}d\theta$,using contour integration.

29. Using the method of contour integration prove that $\int_0^{2\pi}\frac{d\theta}{5-4\cos\theta}=\frac{2\pi}{3}$.

30. Using the method of contour integration prove that $\int_0^{2\pi}\frac{\cos 3\theta d\theta}{5-4\cos\theta}=\frac{\pi}{12}$.

31. Evaluate $\int_0^{2\pi}\frac{d\theta}{13+5\cos\theta}$ by using contour integration.

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32. Prove that $\int_0^{2\pi} \frac{d\theta}{a + b\cos\theta} = \frac{2\pi}{\sqrt{a^2 - b^2}}$, a > b >0 using Contour integration.