ABES Engineering College, Ghaziabad

Department of Applied Sciences & Humanities

Session: 2023-24 **Semester: II** **Section: All**

Code: BAS 203 **Course Name: Engineering Mathematics II**

Assignment 5

Date of Assignment: **Date of submission:**

S.No.	KL, CO		Question	Marks
1	K3,CO5	1.3.1,2.1.3 2.4.4,4.3.4	Integrate $f(z) = Re(z)$ from $z = 0$ to $z = 1 + 2i$. Along the real axis from $z = 0$ to $z = 1$ and then along a line parallel to imaginary axis from $z = 1$ to $z = 1 + 2i$.	5
2	K3,CO5	2.1.3,2.4.1 2.4.4,4.3.4	Evaluate $\oint_c f(z)dz$ where $f(z) = 3z^2 + iz - 4$, C is the square with vertices at 1±i, -1±i .	5
3	K3,CO5	1.3.1,2.1.3 2.4.1,5.2.2	Evaluate: (i) $\oint_c \frac{e^{-z}}{z+1}\, dz$, where c is the circle $\lvert z\rvert = \frac{1}{2}$, (ii) $\oint_c \frac{z+4}{z^2+2z+5}\, dz$, where c is the circle $\lvert z+1\rvert = 1$	5
4	K3,CO5	4.3.4, 2.4.1	Evaluate following by Cauchy's Integral Formula: $\oint_c \frac{4-3z}{z(z-1)(z-2)}\, dz$, where c is the circle $\lvert z\rvert = \frac{3}{2}$.6. $\oint_c \frac{z^2+1}{z^2+1}\, dz$, where c is the circle $\lvert z-1\rvert = 1$.	5
5	K3,CO5	1.3.1,2.1.3 2.4.1,2.4.4	Expand $\frac{1}{(z+1)(z+2)}$ in the regions: (i) $\lvert z\rvert < 1$, (ii) $1 < \lvert z\rvert < 3$, (iii) $\lvert z\rvert > 3$, (iv) $1 < \lvert z+1\rvert < 2$	5
6	K3,CO5	1.3.1,2.1.3 2.4.1,4.3.4	Expand $f(z) = \frac{7z^2+9z-18}{z^3-9z}$ in Laurent series valid for the regions: (i) $0 < \lvert z\rvert < 3$, (ii) $\lvert z\rvert > 3$	5
7	K3,CO5	4.3.3 4.3.4	Find the residue of $f(z) = \frac{z^2}{z^2+3z+2}$ at the pole -1	5
8	K3,CO5	4.3.4	Evaluate the integral $\oint_c \frac{24z-7}{(z-1)^2\,(2z+3)}\, dz$, using Cauchy's residue theorem where c is the circle of radius 2 with Centre at origin.	5
9	K3,CO5	1.2.1,1.3.1 2.4.1	Evaluate the integrals using Cauchy's residue theorem $\oint_c \frac{z^2+4}{z(z^2+2z+2)} dz$, where c is the circle $\lvert z+1+i\rvert = 1$.	5
10	K3,CO5	2.4.1,4.3.4	Evaluate the following integral using contour integration: $\int_0^{\pi} \frac{\cos 2\theta}{5+4\cos\theta}\, d\theta$	5

Answers

1. $\frac{1}{2} + 2i$. **2.** 0 **3. (i)** 0 **(ii)** 0 **4.** $2\pi i$

5. **(i)** $f(z) = \frac{1}{2}\left[\sum_0^\infty (-1)^n z^n - \frac{1}{3}\sum_0^\infty (-1)^n \left(\frac{z}{3}\right)^n\right]$ **(ii)** $f(z) = \frac{1}{2}\left[\frac{1}{z}\sum_0^\infty (-1)^n \left(\frac{1}{z}\right)^n - \frac{1}{3}\sum_0^\infty (-1)^n \left(\frac{z}{3}\right)^n\right]$

(iii) $f(z) = \frac{1}{2}\left[\frac{1}{z}\sum_0^\infty (-1)^n \left(\frac{1}{z}\right)^n - \frac{1}{z}\sum_0^\infty (-1)^n \left(\frac{3}{z}\right)^n\right]$ **(iv)** $f(z) = \frac{1}{2(z+1)}\left[\sum_0^\infty (-1)^n \left(\frac{z+1}{2}\right)^n\right]$

6. **(i)** $f(z) = \frac{2}{z} + \frac{1}{3}\sum_0^\infty (-1)^n \left(\frac{z}{3}\right)^n - \frac{4}{3}\sum_0^\infty \left(\frac{z}{3}\right)^n$ **(ii)** $f(z) = \frac{2}{z} + \frac{1}{z}\sum_0^\infty (-1)^n \left(\frac{3}{z}\right)^n + \frac{4}{z}\sum_0^\infty \left(\frac{3}{z}\right)^n$

7. 1 **8.** 0 **9.** $\boldsymbol{\pi(3 - i)}$, **10.** $\boldsymbol{\frac{\pi}{12}}$.