

 NIET Greater Noida GET FUTURE READY Estd. 2001 AN AUTONOMOUS INSTITUTE	ENGINEERING MATHEMATICS III (AAS0301A) UNIT-II	SESSION: 2022-23
		Branch: CSE/IT/CS Sem: III
Assignment Given Date: 14/10/22 Assignment Submission Date: 28/10/22	Maximum Points: 75 Weightage in University Exam: 30 Marks	
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Note: Write solution of each question in clear handwriting.

Q.N.	Question Statement	Pts	CO	BLOOM'S KNOWLEDGE LEVEL
1	Evaluate $\int_0^{1+2i} \operatorname{Re}(z) dz$ along the real axis from $z = 0$ to $z = 1$ and then along a line parallel to imaginary axis from $z = 1$ to $z = 1 + 2i$.	2	2	K ₅
2	Evaluate the integral $\int_C (z - z^2) dz$ where C is upper half of the circle $ z = 1$. What is the value of integral if C is lower half of the circle?	6	2	K ₅
3	Verify Cauchy integral theorem for $f(z) = z^3$ taken over the rectangle with vertices $-1, 1, 1 + i, -1 + i$.	10	2	K ₃
4	Evaluate $\int_C \frac{z}{z^2+1} dz$ where C is I. $C: \left z + \frac{1}{z}\right = 2$ II. $C: z + i = -1$	10	2	K ₅
5	Evaluate $\int_C \frac{z^2+1}{z^2-1} dz$ by Cauchy Integral Formula where C is circle (i) $ z = \frac{3}{2}$ (ii) $ z - 1 = 1$ (iii) $ z = \frac{1}{2}$	10	2	K ₅
6	Expand $f(z) = \frac{z}{(z-1)(2-z)}$ I. $ z - 1 > 1$ II. $0 < z - 2 < 1$	10	2	K ₃
7	Discuss the type of singularity of the following- I. $\frac{1}{\sin z - \cos z}$ at $z = \frac{\pi}{4}$ II. $\sin\left(\frac{1}{z}\right)$ at $z = 0$ III. $\frac{z - \sin z}{z^3}$ at $z = 0$	6	2	K ₅
8	Using Residue theorem, evaluate $\int_C \frac{z-3}{z^2+2z+5} dz$ where C is the circle $ z + 1 - i = 2$.	6	2	K ₅

9	Using Contour integration evaluate- I. $\int_0^{2\pi} \frac{\sin^2 \theta}{5-4 \cos \theta} d\theta$ II. $\int_0^{\pi} \frac{a d\theta}{a^2 + \sin^2 \theta}$ where $a > 0$ III. $\int_0^{2\pi} \frac{d\theta}{3-2 \cos \theta + \sin \theta}$ IV. $\int_{-\infty}^{\infty} \frac{\cos x}{(x^2 + a^2)(x^2 + b^2)} dx$ where $a, b > 0$	6	2	K ₅
10	Evaluate by contour integration $\int_0^{2\pi} \frac{d\theta}{a+b \sin \theta}$ where $a > b $. Hence evaluate $\int_0^{2\pi} \frac{d\theta}{1-2a \sin \theta + a^2}$	2	2	K ₅

Solution:

1. $2i + \frac{1}{2}$
2. $\frac{2}{3}, -\frac{2}{3}$
3. Prove
4. $2\pi i, \pi i$
5. $0, 2\pi i, 0$
6. $f(z) = \frac{1}{z-1} - \frac{2}{z-1} \sum_{n=0}^{\infty} \frac{1}{(z-1)^n}, f(z) = \sum_{n=0}^{\infty} (-1)^n (z-2)^n - \frac{2}{z-2}$
7. Simple pole, Isolated essential singularity, removable singularity
8. $\pi(i-2)$
9. $\frac{\pi}{4}, \frac{\pi}{\sqrt{(1+a^2)}}, \pi, \frac{\pi}{2(a^2-b^2)} \left(\frac{e^{-b}}{b} - \frac{e^{-a}}{a} \right)$
10. $\frac{2\pi}{\sqrt{(a^2-b^2)}}, \frac{2\pi}{1-a^2}$