



Date: 23-04-2025

Dept. No.

Max. : 100 Marks

Time: 09:00 AM - 12:00 PM

SECTION A - K1 (CO1)	
	Answer ALL the Questions - (10 x 1 = 10)
1.	Fill in the Blanks
a)	$Arg\left(\frac{1+i}{1-i}\right)$ is _____ .
b)	$\int_{ z =1} \frac{z^2+1}{2z+1}$ is _____ .
c)	If $f(z) = \sum_{n=0}^{\infty} a_n z^n$ then a_n is _____.
d)	Residue $\sin\left(\frac{1}{z}\right)$ of at $z = 0$ is _____.
e)	The function $f(z) = \sin z$ is conformal at _____ .
2.	True or False
a)	The function $f(z) = \frac{\overline{z}}{z}$ is continuous at $z = 0$.
b)	If u and v are harmonic conjugates to each other in same domain D then u and v must be constant there.
c)	If $u(x, y) = 2(x^2 - y^2) + 3$ for $ z \leq 2$ then $\underset{ z =2}{Max} u(x, y) = 5$
d)	The transformation $W = \frac{az+b}{cz+d}$ ($ad - bc \neq 0$) where a, b, c, d are complex constants is called linear fractional transformation.
e)	If N is the number of zeros of polynomial $P(z)$ for $ z-a \leq R$ then $\int_{ z-a =R} \frac{P'(z)}{P(z)} = N - P$.
SECTION A - K2 (CO1)	
	Answer ALL the Questions (10 x 1 = 10)
3.	Match the following
a)	a) Zero is 1) Harmonic
b)	b) $u(x, y) = 2(x^2 - y^2) + 3$ 2) $2\pi i(N - P)$
c)	c) $\int_c \frac{1}{z} dz; z =1$ 3) Imaginary
d)	d) $w = z + \frac{1}{z}$ has a fixed point at 4) Both real and complex
e)	e) $\int_c \frac{f'(z)}{f(z)} dz$ 5) $2\pi i$

4.	Answer the following
a)	Show that $f(z) = \begin{cases} \frac{\operatorname{Re}(z^2)}{ z }; & z \neq 0 \\ 0; & z = 0 \end{cases}$ is cts at $ z =0$
b)	Find $\int_C (\sin(z^2) + \cos(z^2)) dz$ where $C: z =1$
c)	Define residue of a function at a point.
d)	Determine then singularities of $f(z) = \frac{3z+1}{z^3-i}$ in C .
e)	Find the fixed point of $w = \frac{(2+i)z-2}{z+i}$.
SECTION B - K3 (CO2)	
Answer any TWO of the following (2 x 10 = 20)	
5.	Find all values of $i^{\sin(i)}$.
6.	Find $\int_{-1}^1 z^i dz$.
7.	Obtain the Laurent's series expansion of $f(z) = \frac{-1}{(z-1)(z-2)}$ in the regions (i) $1 < z < 2$ (ii) $ z > 2$.
8.	Find the Mobius transform which maps 1,-i, 2 on to 0,2,-1 respectively.
SECTION C – K4 (CO3)	
Answer any TWO of the following (2 x 10 = 20)	
9.	Show that $f(z) = \begin{cases} \frac{-2}{z}; & z \neq 0 \\ 0; & z = 0 \end{cases}$ satisfies CR equation at (0,0) but not differential at (0,0).
10.	State and prove Cauchy's residue theorem and hence evaluate $\int_C \frac{5z-2}{z(z-1)} dz$ where C is the circle $ z =2$.
11.	Derive Cauchy Riemann equations in polar coordinates for a differentiable function.
12.	Find the value of $\int_{ z =2} \frac{1}{(z-3)(z^5-1)} dz$
SECTION D – K5 (CO4)	
Answer any ONE of the following (1 x 20 = 20)	
13.	State and prove Cauchy integral formula.
14.	State and prove Taylor's Theorem and obtain the Taylor's series expansion of $\frac{1}{1-z}$.
SECTION E – K6 (CO5)	
Answer any ONE of the following (1 x 20 = 20)	
15.	Prove Liouville's theorem and deduce fundamental theorem of algebra
16.	Evaluate $\int_{-\infty}^{\infty} \frac{\cos x}{(x^2+4^2)(x^2+3^2)} dx$.

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