Reg. No. | | | | | | | | |

G. VENKATASWAMY NAIDU COLLEGE (AUTONOMOUS), KOVILPATTI – 628 502.

UG DEGREE END SEMESTER EXAMINATIONS - APRIL 2025.
(For those admitted in June 2021 and later)

PROGRAMME AND BRANCH: B.Sc., MATHEMATICS

SEM	CATEGORY	COMPONENT	COURSE CODE	COURSE TITLE
VI	PART-III	CORE	U21MA613	COMPLEX ANALYSIS

Date & Session:24.04.2025/FN **Time : 3 hours** **Maximum: 75 Marks**

Course Outcome	Bloom's K-level	Q. No.	**SECTION – A (10 X 1 = 10 Marks)** Answer ALL Questions.
CO1	K1	1.	If f(z)=z^3, z=x+iy then the value of v(x,y) is. a) x^3-3xy^2 b) $3x^2y-y^3$ c) $3xy^2-y^3$ d) $3x^2y-x^3$
CO1	K2	2.	The Complex form of CR equation is. a) $f_x=if_y$ b) $f_y=-if_x$ c) $f_x=-if_y$ d) $f_x=f_y$
CO2	K1	3.	Any bilinear transformation with only one finite fixed point is called. a) Parabolic b) Hyprbolic c) Elliptic d) None of these
CO2	K2	4.	The transformation w= $\bar{z}$ is. a) bilinear transformation b) not a bilinear transformation c) inverse transformation d) None of these
CO3	K1	5.	The value of $\int_c \frac{dz}{z-3}$ where C is the circle $\|z-2\|$ =5. a) 2 b) -2 c) 0 d) 1
CO3	K2	6.	The value of $\frac{1}{2\pi i}\int_c \frac{z^2+5}{z-3}$dz where C is $\|z\|$=4 is. a)15 b) 14 c) 10 d) 0
CO4	K1	7.	The Taylors series expansion of f(z) about the point zero is called the. a) Laurents series b) Maclaurins series c) Power series d) None of these
CO4	K2	8.	The zero of f(z)=sinz is. a) 1 b) 2 c) 0 d) 3
CO5	K1	9.	The poles of f(z) =$\frac{z^2}{(z-2)(z-3)}$. a) 2,3 b) -2,3 c) 2,-3 d)-2,-3
CO5	K2	10.	The residue of f(z)=$\frac{e^z}{z^2}$ is. a) 0 b) 1 c) 2 d) 3

Course Outcome	Bloom's K-level	Q. No.	**SECTION – B (5 X 5 = 25 Marks)** Answer ALL Questions choosing either (a) or (b)
CO1	K3	11a.	State and Prove complex form of CR equations. **(OR)**
CO1	K3	11b.	If $\frac{\partial^2}{\partial x\partial y}=\frac{\partial^2}{\partial y\partial x}$ prove that $\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}=4\frac{\partial^2}{\partial z\partial \bar{z}}$

CO2	K3	12a.	Prove that any bilinear transformation preserves cross ratio. **(OR)**
CO2	K3	12b.	Find the invariant points of the transformation. i. $w=\frac{1+z}{1-z}$ ii. $W=\frac{1}{z-2i}$
CO3	K4	13a.	Evaluate $\int_C \bar{z}\, dz$ from z=0 to z=4+2i along the curve C consisting of the line segment from z=0 to z=2i followed by the line segment from z=2i to z=4+2i. **(OR)**
CO3	K4	13b.	Evaluate $\int_C \frac{zdz}{z^2-1}$ where C is th positively oriented circle $\|z\|=2$.
CO4	K4	14a.	Expand cosz into a Taylor's series about the point $z=\frac{\pi}{2}$ and determine the region of convergence. **(OR)**
CO4	K4	14b.	Find the Laurent's series for $\frac{z}{(z+1)(z+2)}$ about z=-2.
CO5	K5	15a.	Find the poles of $f(z)=\frac{z^2+4}{z^3+2z^2+2z}$ and determine the residues at the poles. **(OR)**
CO5	K5	15b.	Prove that $\int_C \frac{e^{2z}}{(z+1)^3}dz=\frac{4\pi i}{e^2}$ where C is $\|z\|=\frac{3}{2}$.

Course Outcome	Bloom's K-level	Q. No.	<u>SECTION – C</u> (5 X 8 = 40 Marks) Answer <u>ALL</u> Questions choosing either (a) or (b)
CO1	K3	16a.	Show that $u(x,y)=\sin x\cosh y+2\cos x\sinh y+x^2-y^2+4xy$ is harmonic.Find an analytic function f(z) interms of z with the given u for its real part. **(OR)**
CO1	K3	16b.	Given the function $w=z^3$ where w=u+iv.Show that u and v satisfy the CR equations ,Prove that the families of curves $u=c_1$ and $v=c_2$ (c_1 and c_2 are constants) are orthogonal to each other.
CO2	K4	17a.	Determine the bilinear transformation which maps 0,1,∞ into i,-1,-I respectively.Under this transformation show that the interior of the unit circle of the z plane maps onto the half plane left to the v axis(left half of the w plane). **(OR)**
CO2	K4	17b.	Prove that a bilinear transformation $w=\frac{az+b}{cz+d}$ where ad-bc≠0 maps the real axis into itself iff a,b,c,d are real.
CO3	K4	18a.	Show that $\int_C \|z\|^2 dz=-1+i$ where C is the square with vertices O(0,0),A(1,0),B(1,1) and C(0,1). **(OR)**
CO3	K4	18b.	State and Prove Cauchy's theorem.
CO4	K5	19a.	State and Prove Taylor's series. **(OR)**
CO4	K5	19b.	Find the Laurent's series expansion of the function $\frac{z^2-1}{(z+2)(z+3)}$ valid in the annular region $2<\|z\|<3$.
CO5	K5	20a.	Stat and Prove Cauchy's Residue theorem. **(OR)**
CO5	K5	20b.	Evaluate ,using i.Cauchy's integral formula ii.Residue theorm $\int_C \frac{Z+1}{Z^2+2Z+4}dz$ where C is the Circle $\|z+1+i\|=2$.