



R22 Regulation

Subject code: 4B3BA

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech III Semester Regular Examinations, February 2024

COMPLEX ANALYSIS & VECTOR CALCULUS

(Common to EEE & ECE)

Maximum Marks: 60

Date:16.02.2024 Duration: 3 hours

Part-A		CO	Bloom Tx
All the following questions carry equal marks (10x1M=10 Marks)			
1.a)	Write the Cauchy's Riemann equation in cartesian form.	CO1	L1
b)	If 'u' is the function of x and y, then conjugate of u is _____	CO1	L2
c)	If $f(z) = \frac{\sin z}{z}$ and $z = 0$ is a singular point. Identify the type of singularity.	CO2	L2
d)	The series $\sum_{n=0}^{\infty} a_n (z-a)^n$ is called the _____ part of $f(z)$.	CO2	L1
e)	The residue at a pole of order m is _____	CO3	L2
f)	An analytic function $f(z)$ is said to have a zero of order m if _____	CO3	L2
g)	If $\nabla \times \vec{F} = \vec{0}$, then $\vec{F}$ is called _____	CO4	L2
h)	If ϕ is a scalar point function, then the unit normal vector $\hat{n}$ is _____	CO4	L2
i)	Stokes theorem states that _____	CO5	L2
j)	Gauss divergence theorem is applicable only for _____	CO5	L2
Part-B			
Answer All the following questions. (5X10M=50Marks)			Bloom Tx level
2	Show that the function $u = \frac{1}{2} \log(x^2 + y^2)$ is harmonic and determine its conjugate also find $f(z)$. [10]	CO1	L3
OR			
3	If $w = u(x, y) + iv(x, y)$ is an analytic function, show that the curves of the family $u(x, y) = a$ and the curves of the family $v(x, y) = b$ cuts orthogonally, where a and b are varying constants. [10]	CO1	L3
4	Using Cauchy's integral formula, evaluate $\int_C \frac{z}{(z-1)(z-2)^2} dz$ where C is the circle $ z-2 = \frac{1}{2}$. [10]	CO2	L3
OR			
5	Find the Laurent's series expansion of $\frac{7z}{z(z-2)(z+1)}$ valid in the region $1 < z+1 < 3$. [10]	CO2	L3
6	Find the residue of $\frac{z^2-2z}{(z+1)^2(z^2+4)}$ at each of its poles. [10]	CO3	L3
OR			

7	Evaluate $\int_0^{2\pi} \frac{d\theta}{13+5\sin\theta}$ using contour integration. [10]	CO3	L3
8	Show that $\vec{F} = (6xy + z^3)\vec{i} + (3x^2 - z)\vec{j} + (3xz^2 - y)\vec{k}$ is irrotational and also find its scalar potential. [10]	CO4	L3
	OR		
9	Find the angle between the surface $z = x^2 + y^2 - 3$ and $x^2 + y^2 + z^2 = 9$ at the point $(2, -1, 2)$ [10]	CO4	L3
10	Verify Gauss divergence theorem for $\vec{F} = (x^2 - yz)\vec{i} + (y^2 - zx)\vec{j} + (z^2 - xy)\vec{k}$ over the rectangular parallelepiped $0 \leq x \leq a, 0 \leq y \leq b$ and $0 \leq z \leq c$. [10]	CO5	L3
	OR		
11	Justify Stokes theorem for $\vec{F} = (x^2 - y^2)\vec{i} + 2xy\vec{j}$ taken around the rectangle bounded by the lines $x = 0, x = a, y = 0, y = b$. [10]	CO5	L3