R20 Regulation *Subject code: 3B3DA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech III Semester Supplementary Examinations, December 2025

COMPLEX ANALYSIS AND VECTOR CALCULUS

(ECE)

Maximum Marks: 70 Date: 15.12.2025 Duration: 3 hours

Note: **1.This question paper contains two parts A and B.**
2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10X2M=20 Marks)		Marks	CO	BTL
1	Show that $u(x,y)=x^3-3xy^2$ is harmonic.	2M	1	L1
2	Using Milne-Thomson method find $f(z)$ given that $f'(z)=3x^2-3y^2+6ixy$	2M	1	L1
3	Evaluate $\int_c z^2dz$ where c is the straight line segment from O(Z=0) to A(Z=2+i).	2M	2	L1
4	Expand e^x about z=0in Taylor's series expansion.	2M	2	L1
5	Classify the nature of the function f(z)=.$\frac{z-\sin z}{z^5}$	2M	3	L1
6	Find the residues of $\frac{z.e^z}{(z-1)^3}$ at its poles.	2M	3	L1
7	Define gradient of a scalar point function.	2M	4	L1
8	Find the normal vector to the surface $x^2y+2xz=4$ at the point (2,-2,3).	2M	4	L1
9	State Stoke's theorem.	2M	5	L1
10	State Gauss divergence theorem.	2M	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
11	If $f(z)=\frac{1}{2}\log(x^2+y^2)+i\tan^{-1}\left(\frac{px}{y}\right)$ is an analytic function , then find the value of p	10M	1	L2
	OR			
12	If f(z) is a Regular function of z, then prove that $\left[\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right]\|f(z)\|^2=4\|f'(z)\|^2$	10M	1	L2
13	State and prove Cauchy's integral formula.	10M	2	L2
	OR			
14	Evaluate the integrals around c:|z-1|=3 i) $\int_c \frac{e^z}{(z+1)^2}dz$ ii) $\int_c \frac{e^z}{(z+1)^4}dz$	10M	2	L2

15	Evaluate $\int_c \frac{4-3z}{z(z-1)(z-2)}$; where c is the circle $\|z\|=\frac{3}{2}$. using residue theorem.	10M	3	L2
	OR			
16	Use the method of contour integration to evaluate $\int_0^\infty \frac{dx}{x^4+a^4}$ dx	10M	3	L2
17	If $\bar{r}$ is the position vector of any point in space, then find $\nabla.\nabla(\log r)$.	10M	4	L2
	OR			
18	Prove that $\nabla x(\nabla x\bar{a}) = \nabla(\nabla.\bar{a}) - \nabla^2\bar{a}$.	10M	4	L2
19	Verify gauss divergence theorem for $F = x^3\bar{\imath} + y^3\bar{\jmath} + z^3\bar{k}$ taken over the parallelopiped bounded by x=0,x=a,y=0,y=b,z=0,z=c.	10M	5	L2
	OR			
20	Verify Green's theorem for $F = x^3\bar{\imath} + y^3\bar{\jmath}$ taken over the rectangle bounded by x=0,x=a,y=0,y=b.	10M	5	L2

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