R20 Regulation *Subject code: 3B3DA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech III Semester Supplementary Examinations, June 2026

COMPLEX VARIABLES AND VECTOR CALCULUS

(ECE)

Maximum Marks: 70 Date: 09.06.2026 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	Define Analytic Function.	2M	1	L1
2	Define Harmonic Function.	2M	1	L1
3	Expand f(z) = sin z about z=π by using Taylor's series.	2M	2	L1
4	Let c be the circle |z|=3 described in the positive sense find $\int_c \frac{z+3}{z-2} dz$.	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 a unit normal vector to the given surface $x^2y + 2xz = 4$ at the point (2,-2,3).	2M	4	L1
9	State gauss divergence theorem.	2M	5	L1
10	If F = $3xy\bar{\imath} - y^2\bar{\jmath}$, then $\int_c \bar{F}.d\bar{r}$. where C is the curve y=x *in the* XY – plane from (0,0)to (1,1).	2M	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
11	If u+v =e^x (cos y + sin y) then find the analytic function f(z).	10M	1	L2
	OR			
12	Derive the C- R equations in polar form.	10M	1	L2
13	State and prove Cauchy's integral theorem.	10M	2	L2
	OR			
14	Expand the Laurent's series for f(z)=$\frac{z}{(z-1)(z-3)}$ in the region 0<|z-1|<2	10M	2	L2
15	Find the poles and residues at each pole of f(z) = $\frac{\cot z . \cot hz}{z^3}$	10M	3	L2
	OR			
16	Evaluate by contour integration $\int_0^{2\pi} \frac{d\theta}{2+\cos\theta}$	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