R17 Regulation *Subject code:1B3AA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech II Year I Semester Supplementary Examinations, July 2024

MATHEMATICS IV

(Common to CE,EEE,ME,ECE,CSE & IT)

Maximum Marks: 70 Date:18.07.2024 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)

1	Define Harmonic function.
2	Find all values of K, such that f(z) = $e^{x}(\cos ky + i \sin ky)$ is analytic.
3	State Cauchy integral theorem.
4	State Cauchy integral formula.
5	Define essential singularity, removable singularity.
6	Find the residue of $F(Z) = \frac{1}{(Z+1)(Z-1)}$ at Z= 1.
7	If f$(x) = 1$ in $(0,2\pi)$ then find a_n.
8	If f$(x) = x^2$ in $(-l, l)$ then find a_0.
9	State the modulation theorem for Fourier transforms.
10	Find the Fourier Sine transform of x.

Part-B

Answer All the following questions. (5X10M=50Marks)

11	Show that for f(z)= $\begin{cases} \frac{\left((x^3-y^3)+i(x^3+y^3)\right)}{x^2+y^2} & if\ z \neq 0 \\ 0 & if\ z = 0 \end{cases}$ f' (z) does not exist at origin, although C – R equations are satisfied at the origin. [10]	
	OR	
12	Show that the function u = $e^{-2xy}\sin(x^2 - y^2)$ is harmonic, find the conjugate function ' V ' and express u + iv as an analytic function of Z. [10]	
13	State and prove Taylor's theorem. [10]	
	OR	
14	Evaluate: (i)$\oint \frac{e^z}{(z-1)(z-4)} dz$ around the circle $\|z\| = 2$. [5] (ii)$\oint \frac{\sin 6_z}{\left(z-\frac{\pi}{2}\right)^3} dz$ around a circle $\|z\| = 1$. [5]	
15	Evaluate $\int_{-\infty}^{\infty} \frac{dx}{x^6+1}$. [10]	
	OR	

16	Find the Residue at each pole of $f(z) = \frac{4Z^2-4Z+1}{(Z-1)^2(Z-2)(Z^2+4)}$.	[10]
17	Find the Fourier series of $f(x) = x - x^2$ in the interval $[-\pi, \pi]$.	[10]
	OR	
18	Obtain the Fourier Sine series of $f(x) = \sin x$ in $(0, \pi)$.	[10]
19	Find the finite Fourier sine and Cosine transform, of f (x) = sin ax in $(0, \pi)$	[10]
	OR	
20	Solve the boundary value problem $u_{tt} = a^2 u_{xx}$; $0 < x < l$; $t > 0$ with u (0,t) = 0 ; u (l,t) = 0 and u (x,0) = 0, u_t (x,0) = $sin^3(\frac{\pi x}{l})$	[10]