R18 Regulation Subject code: 2B4BA

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech IV Semester Supplementary Examinations, September 2023

Special Functions & Complex Variables

(Common to EEE & ECE)

Maximum Marks: 70 Date:13.09.2023 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 Find the value of Γ(1)

2 Find the value of Γ(n+1),If n is a positive integer

3 Show that $u(x,y) = x^3 - 3xy^2$ is harmonic

4 Find 'k' such that $f(x,y) = x^3 + 3kxy^2$ be harmonic.

5 Evaluate $\int_c f(z)dz$ where f(z)=y-x-3ix^2 and c is the straight-line segment from 0 to 1+i

6 Expand e^x about z = 0 in Taylor's series expansion.

7 Classify the nature of the singularity of the function f(z) = $\frac{e^{-z}}{(z-2)^4}$

8 Find the residues of the function f(z)= $\frac{e^{-z}}{(z-2)^4}$

9 Define Conformal Mapping

10 List the cross ratio property of four points

Part-B

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

11 Show that a) β(m,n)=$2\int_0^{\frac{\pi}{2}} sin^{2m-1}\theta cos^{2n-1}\theta d\theta$ (5M)

b) Γ(n)=$\int_0^1 \left(log\frac{1}{x}\right)^{n-1} dx; n > 0.$ (5M)

OR

12 Find the relation between Beta and Gamma functions. (10M)

13 If u+v =$e^x(\cos y + \sin y)$ then find the analytic function f(z). (10M)

OR

14 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)

15 State and prove Cauchy's integral theorem. (10M)

OR

16 Expand f(z)= $\frac{1}{(z+1)(z+3)}$ in the Laurent's series valid for the region (10M)

i) |z|<1 ii) 1<|z|<3

17 Evaluate $\int_C \frac{4-3z}{z(z-1)(z-2)}$; where c is the circle |z|=$\frac{3}{2}$. using residue theorem (10M)

OR

18 Find the poles and the corresponding residues of $\frac{1}{(z^2-1)^3}$ (10M)

19 S.T the relation $w = \frac{5-4z}{4z-2}$ transforms the circle $|z| = 1$ into a circle of radius unity in the w-plane. (10M)

OR

20 Find the bilinear Transformation that maps the points (0,i,-1) into the points (0,1,∞). (10M)