

## ANURAG Engineering College

(An Autonomous Institution)

II B.Tech I Semester Supplementary Examinations, Jan/Feb-2024

MATHEMATICS - IV

(COMMON TO EEE &amp; ECE)

Time: 3 Hours

Max. Marks: 75

## Section – A (Short Answer type questions)

(10 Marks)

Answer All Questions

|  | Course Outcome | B.T Level | Marks |
|--|----------------|-----------|-------|
| 1. Write Fourier sine and Fourier Cosine Integrals.                  | CO1            | L1        | 2M    |
| 2. Show that $F_s \{ x f(x) \} = -\frac{d}{ds} [ F_c(P) ]$           | CO1            | L2        | 3M    |
| 3. Write Cauchy's Riemann equations in Cartesian form and Polar form | CO2            | L2        | 2M    |
| 4. Separate the real and imaginary parts of $\cot z$                 | CO2            | L1        | 3M    |
| 5. Define Isolated singularity.                                      | CO3            | L1        | 2M    |
| 6. Evaluate $\int_0^{1+i} (x^2 - iy) dz$ along the path $y=x$        | CO3            | L1        | 3M    |
| 7. State Cauchy's residue theorem.                                   | CO4            | L2        | 2M    |
| 8. Find the residue of $f(z) = \frac{z^2}{z^2 + a^2}$ at $z = ia$    | CO4            | L1        | 3M    |
| 9. Define conformal mapping.   | CO5            | L2        | 2M    |
| 10. Find fixed points of the transformation $W = \frac{6z-9}{z}$     | CO5            | L2        | 3M    |

## Section B (Essay Questions)

Answer all questions, each question carries equal marks.

(5 X 10M = 50M)

11. A) Find cosine transform of  $(x)$  defined by  $f(x) =$
- $$\begin{cases} x, & 0 < x < 1 \\ 2-x, & 1 < x < 2 \\ 0, & x > 2 \end{cases}$$
- OR
- B) Find the Inverse Fourier Cosine transform of  $\frac{\sin ap}{p}$
12. A) Show that the  $f(x) = \sqrt{|xy|}$  is not analytic at the origin although Cauchy Riemann equations are satisfied at that point.
- OR
- B) Show that  $U(x,y) = x^3 - 3xy^2$  is harmonic and find its harmonic conjugate and the corresponding analytic function  $f(z)$  in terms of  $z$ .
13. A) Evaluate  $\int_{(0,0)}^{(1,1)} (3x^2 + 4xy + i x^2) dz$  along the path  $y=x^2$
- OR
- B) Obtain the Taylor's Series to represent the function  $f(z) = \frac{e^z}{z(z+1)}$  about at  $|z| = 2$
14. A) Evaluate  $\int_C \frac{dz}{(z^2 + 4)^2}$  where  $C$  is circle  $|z - i| = 2$
- OR
- B) Show that  $\int_0^\pi \frac{d\theta}{a + b \cos \theta} = \frac{\pi}{\sqrt{a^2 - b^2}}$  ( $a > b > 0$ )

15. A) Under the transformation  $w = \frac{1}{z}$  find the image of the circle  $|z - 2i| = 2$  CO5 L3 10M

**OR**

B) Find the bilinear transformation which maps the points  $(-i, 0, i)$  into the points  $(-1, i, 1)$  respectively. CO5 L3 10M