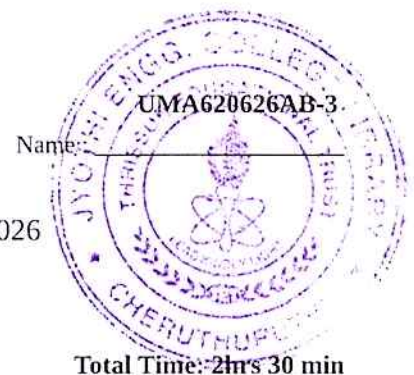


Reg No.: _____



Jyothi Engineering College(Autonomous)
BTech Degree S2 (Challenge Course) Examination, June 2026
(2025 Scheme)

**25MAT302 - MATHEMATICS FOR ELECTRICAL
SCIENCE AND PHYSICAL SCIENCE-3**



Name: _____

Total Mark: 60

Total Time: 2hrs 30 min

CO MARK

PART A

(Answer All Questions. Each question carries 3 marks)

1. Determine the Fourier Sine Transform of $f(x) = 3x, 0 < x < 6$ CO1 (3)
2. Find Fourier Cosine integral of $f(x) = \begin{cases} 1, & |x| < 1 \\ 0, & |x| > 1 \end{cases}$ CO1 (3)
3. Find the points, if any in complex plane where the function $f(x) = 2x^2 + y + i(y^2 - x)$ is (i) differentiable (ii) analytic CO2 (3)
4. Test the continuity at $z = 0$ if $f(z) = \frac{\text{Im}z}{|z|}, z \neq 0$. CO2 (3)
5. Evaluate $\int_C \frac{\sin z}{z^2 e^z} dz$ where C is $|z| = 1$. CO3 (3)
6. Evaluate $\int_C \text{Re}z dz$ where C is the parabola $y = 1 + \frac{1}{2}(x-1)^2$ from $1+i$ to $3+i$. CO3 (3)
7. Prove that $f(z) = \frac{z - \sin z}{z^3}$ has removable singularity at $z = 0$. CO4 (3)
8. Expand $f(z) = \frac{1}{z^2}$ as a Taylor series about $z = 3$. State the region of validity. CO4 (3)

PART B

(Answer any one full question from each module, each question carries 9 marks)

Module - 1

9. a) Find the Fourier integral representation of $f(x) = \begin{cases} \pi - x, & 0 < x < \pi \\ 0, & \text{otherwise} \end{cases}$ CO1 (5)
b) Find the Fourier Cosine transform of $f(x) = \begin{cases} x, & 0 < x < 2 \\ 0, & \text{otherwise} \end{cases}$ CO1 (4)

OR

10. a) Find the Fourier transform of $f(x) = e^{-|x|}, -\infty < x < \infty$ CO1 (5)
b) Find Fourier sine integral of $f(x) = \begin{cases} \sin x, & 0 < x < \pi \\ 0, & x > \pi \end{cases}$ CO1 (4)

Module - 2

11. a) Find the value of a so that $u = xy + ax^2 - y^2$ is harmonic. Find its harmonic Conjugate. CO2 (5)
b) Determine the region of the w -plane into which the triangular region bounded by $x = 1, y = 1$ and $x + y = 1$ is mapped by $w = z^2$. CO2 (4)

OR

12. a) Show that the function $u = \frac{x}{x^2 + y^2}$ is harmonic and hence find its harmonic conjugate. CO2 (5)
b) Find the image of the lines $x = \pm \frac{\pi}{2}$ under the mapping $w = \sin z$. CO2 (4)

Module - 3

13. a) Evaluate $\int_0^{2+i} \bar{z}^2 dz$ along CO3 (5)
 (i) the real axis to 2 and then vertically to 2+i
 (ii) the line $y = mx$.

- b) Using Cauchy's integral formula, evaluate $\int_C \frac{z+4}{z^2+2z+5} dz$ where C is $|z+1-i|=2$. CO3 (4)

OR

14. a) Using Cauchy's integral formula evaluate $\int_C \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)(z-2)} dz$ where C is $|z|=3$. CO3 (5)

- b) Evaluate $\int_C \left[\frac{5}{z-2i} - \frac{6}{(z-2i)^2} \right] dz$ where C is the circle $|z-2i|=4$ clockwise. CO3 (4)

Module - 4

15. a) Find the Laurent's series expansion of $\frac{1}{z-z^3}$ in $1 < |z+1| < 2$. CO4 (5)

- b) Evaluate $\int_C \frac{e^z}{\cos \pi z} dz$ where C is $|z|=1$. CO4 (4)

OR

16. a) Find Laurent's series expansion for $\frac{z^2-1}{z^2-5z+6}$ about $z=0$ in the region $2 < |z| < 3$. CO4 (5)

- b) Evaluate $\int_C \frac{z-23}{z^2-4z-5} dz$ where C is $|z-2-i|=3.2$ by Cauchy's Residue theorem. CO4 (4)
