ROLL NO.

PRESIDENCY UNIVERSITY, BENGALURU SCHOOL OF ENGINEERING

Max Marks: 80 Max Time: 120 Minutes Weightage: 40 %

END TERM FINAL EXAMINATION

I Semester AY 2017-18 Course: MAT 103 ENGINEERING MATHEMATICS - III 23 DEC 2017

Instructions:

- i. Write legibly.
- ii. Scientific and non-programmable calculators are permitted.

Part A (Answer ALL the questions)

 $(4Q \times 5M = 20 \text{ Marks})$

- 1. Find the inverse Z transform of $U(z) = \frac{2z^2 + 3z}{(z+2)(z-4)}$.
- 2. Show that the function $u(x, y) = x^2 y^2 + 2x$ is harmonic.
- 3. Using Cauchy's integral formula evaluate $\oint_C \frac{z^2+1}{z^2-1} dz$, where C is the circle |z-1|=1.
- 4. Find the Laurent series expansion of $f(z) = z^{-5} \sin z$ with center z = 0.

Part B (Answer any THREE questions)

 $(3Q \times 10M = 30 \text{ Marks})$

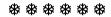
- 5. If $U(z) = \frac{2z^2 + 5z + 14}{(z-1)^4}$, determine u_2 and u_3 by means of the initial value theorem on Z transform.
- 6. Show that $f(z) = \sin z$ is analytic everywhere and hence find its derivative f'(z).
- 7. Using Cauchy's integral formula for derivatives, evaluate $\oint_C \frac{e^{2z}}{(z+i)^4} dz$, where C is the circle |z|=3.

8. Discuss the transformation $w = z^2$.

Part C (Answer any TWO questions)

 $(2Q \times 15M = 30 \text{ Marks})$

- 9. Using Z transform solve the difference equation $u_{n+2} + 4u_{n+1} + 3u_n = 2^n$ with $u_0 = 0$ and $u_1 = 1$.
- 10. Determine the analytic function whose real part is $e^x(x\cos y y\sin y)$.
- 11. Using residue theorem evaluate $\oint_C \frac{z^2}{(z-1)^2(z+2)} dz$, where C is the circle $|z| = \frac{5}{2}$.





PRESIDENCY UNIVERSITY, BENGALURU SCHOOL OF ENGINEERING

Max Marks: 40 Max Time: 60 Minutes Weightage: 20 %

TEST 2

I Semester AY 2017-2018 Course: MAT 103 Engineering Mathematics - III 28 October 2017

Instructions:

i. Write legibly.

ii. Scientific and non-programmable calculators are permitted.

Part A

 $(3Q \times 4M = 12 \text{ Marks})$

- 1. Find the Z transform of $n^2 + 2n + 1$.
- **2.** Find the Z transform of ne^{an} .
- 3. Find the Fourier sine transform of the function $f(x) = \begin{cases} 1 & \text{if } 0 \le x < 2 \\ 0 & \text{if } x \ge 2 \end{cases}$.

Part B

 $(2Q \times 8M = 16 \text{ Marks})$

- 4. Prove that $Z[\cos n\theta] = \frac{z^2 z\cos\theta}{z^2 2z\cos\theta + 1}$ and $Z[\sin n\theta] = \frac{z\sin\theta}{z^2 2z\cos\theta + 1}$.
- 5. Find the Fourier cosine transform of e^{-ax} . Hence deduce that

$$\int_{0}^{\infty} \frac{\cos sx}{s^2 + a^2} \, ds = \frac{\pi}{2a} \, e^{-ax} \, (a > 0).$$

 $(1Q \times 12M = 12 \text{ Marks})$

6. Using Laplace transform solve the differential equation $\frac{d^2y}{dt^2} - 3\frac{dy}{dt} + 2y = e^{3t}$ with the initial conditions y(0) = y'(0) = 0.

OR

7. Find the Fourier transform of the function $f(x) = \begin{cases} 1 - x^2 & \text{if } |x| \le 1 \\ 0 & \text{if } |x| > 1 \end{cases}$. Hence evaluate the

integral
$$\int_{0}^{\infty} \frac{\sin x - x \cos x}{x^3} \cos(x/2) dx.$$



PRESIDENCY UNIVERSITY, BENGALURU SCHOOL OF ENGINEERING

Max Marks: 40 Max Time: 60 Minutes Weightage: 20 %

TEST 1

I Semester 2017-2018 Course: MAT 103 Engineering Mathematics - III 22 September 2017

Instructions:

i. Write legibly.

ii. Scientific and non-programmable calculators are permitted.

Part A $(30 \times 4M = 12 \text{ Marks})$

1. Find the Laplace transform of $(t+1)^2 e^{-t}$.

2. Find the Laplace transform of $\sin 3t - 2t \cos 2t$.

3. Find the inverse Laplace transform of $\frac{1}{s(s^2+1)}$.

Part B $(3Q \times 6M = 18 \text{ Marks})$

4. Find $L \left[e^{-3t} \int_{0}^{t} \frac{\sin t}{t} dt \right]$.

5. Verify the initial and final value theorems for the function $f(t) = 1 + e^{-2t}$.

6. Find $L^{-1} \left[\frac{s}{s^2 + 4s + 5} \right]$.

Part C

 $(1Q \times 10M = 10 \text{ Marks})$

7. Show that the Laplace transform of the square wave function defined by $f(t) = \begin{cases} 1 & \text{if } 0 < t < a \\ -1 & \text{if } a < t < 2a \end{cases}$ with period 2a is $\frac{1}{s} \tanh\left(\frac{as}{2}\right)$.

OR

8. Find the inverse Laplace transform of $\frac{1}{(s+1)(s^2+4)}$.