ROLL NO:	

PRESIDENCY UNIVERSITY, BENGALURU

SCHOOL OF ENGINEERING

Weightage: 20 %   Max Marks: 40   Max Time: 1 hr.   Saturday, 22nd September, 2018

TEST – 1   **SET B**

Odd Semester 2018-19   Course: **MAT 103 Engineering Mathematics-III**   III Sem. Common to All Branches

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Instructions:

(i) *Read the questions properly and answer accordingly.*
(ii) *Question paper consists of 3 parts.*
(iii) Scientific and Non-programmable calculators are permitted.

Part A

(2 Q x 6 M = 12 Marks)

1. Expand $f(x)=1+x$ as a Fourier series over the interval $(-\pi, \pi)$.

2. Find the Fourier sine transform of $f(t)=e^{-at}$, where $a>0$.

Part B

(2 Q x 8 M = 16 Marks)

3. Expand $f(x)=\cos x$ as a half range Fourier sine series over the interval $(0, \pi)$.

4. Expand $f(x)=x$ as a sine series over the interval $(0, L)$ and hence deduce the sum of the series $\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+------\infty$.

Part C

(1Q x 12 M = 12 Marks)

5. Find the Fourier series, up to the second harmonic, for the function $y=f(x)$, given that

x	0	T/6	T/3	T/2	2T/3	5T/6	T
y	0	9.2	14.4	17.8	17.3	11.7	0

OR

6. Find the Fourier transform of $f(t)=\begin{cases} 1 \text{ if } |t|\le a \\ 0 \text{ if } |t|>a \end{cases}$. Hence evaluate the integral $\int_0^\infty \frac{\sin t}{t}\,dt$.

ROLL NO:	

PRESIDENCY UNIVERSITY, BENGALURU

GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

SCHOOL OF ENGINEERING

Weightage: 20 % Max Marks: 40 Max Time: 1 hr. Saturday, 22nd September, 2018

TEST –1 **SET A**

Odd Semester 2018-19 Course: **MAT 103 Engineering Mathematics- III** III Sem. Common to All Branches

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Instruction:

(i) *Read the question properly and answer accordingly.*

(ii) *Question paper consists of 3 parts.*

(iii) Scientific and Non-programmable calculators are permitted.

Part A

(2 Q x 6 M = 12 Marks)

1. Obtain the Fourier series of $f(x) = \frac{\pi - x}{2}$ in $0 < x < 2\pi$.

2. State and prove Modulation property of Fourier transforms

Part B

(2 Q x 8 M = 16 Marks)

3. Obtain the Fourier series of $f(x) = \begin{cases} 1 & (0, \pi) \\ 2 & (\pi, 2\pi) \end{cases}$.

Hence using Parseval's identity show that $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2}$

4. Find the Fourier Cosine series of $f(x) = 2x - 1$ in $0 < x < 1$.

Also deduce that $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2}$

Part C

(1Q x 12 M = 12 Marks)

5. Compute the Fourier coefficients and express the Fourier series upto second harmonics for the following data

x	0	1	2	3	4	5
y	0	9.2	14.4	17.8	17.3	11.7

OR

6. Obtain the Fourier transform of $f(x) = \begin{cases} 1 & |x| \le 1 \\ 0 & |x| > 0 \end{cases}$.

Hence evaluate $\int_0^\infty \frac{\sin x}{x} dx$

ROLL NO:

PRESIDENCY UNIVERSITY
BENGALURU

GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

SCHOOL OF ENGINEERING

SET B

TEST 2

Odd Semester: 2018-19

Course Code: MAT 103

Course Name: Engineering Mathematics III

Branch & Sem: All Branches & III Sem

Date: 24 November 2018

Time: 1 Hour

Max Marks: 40

Weightage: 20%

Instructions:

(i) Read the questions properly and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and Non-programmable calculators are permitted.

Part A

Answer **all** the Questions. **Each** question carries **four** marks. (3x4=12)

1. Find the Z transform of n^2a^n.

2. Find the inverse DTFT of the frequency response $X(\omega)=\begin{cases}1 & if\ |\omega|\le\omega_0\\ 0 & if\ \omega_0\le|\omega|\le\pi\end{cases}$.

3. Determine the transfer function $H(\omega)$ from the difference equation $y(n)-4y(n-1)-3y(n-2)=x(n)+x(n-1)$.

Part B

Answer **all** the Questions. **Each** question carries **eight** marks. (2x8=16)

4. Using the initial value theorem on Z transform, compute the values of u_0, u_1, u_2 and u_3 given that $U(z)=\dfrac{2z^2+3z+12}{(z-1)^4}$.

5. Using fast Fourier transform method find the Fourier transform of $\{2, 0, 0, 1\}$.

Part C

Answer **any one complete** Question. The question carries **twelve** marks. (1x12=12)

6. Use the Z transform method to solve the difference equation $u_{n+2}-5u_{n+1}+6u_n=1$ with the conditions $u_0=0$ and $u_1=1$.

7. (a) Find the DTFT of the function $u(n+3)-u(n-3)$.

   (b) Let $x(n)=\{2, A, 3, 0, 4, 0, B, 5\}$ be a finite sequence. If $X(0)=18$ and $X(4)=0$, find the values of A and B using properties of DFT.

ROLL NO:

PRESIDENCY UNIVERSITY, BENGALURU

SCHOOL OF ENGINEERING — SET A

TEST 2

Odd Semester: 2018-19 — **Date**: 24 November 2018

Course Code: MAT 103 — **Time**: 1 Hour

Course Name: Engineering Mathematics-III — **Max Marks**: 40

Branch & Sem: All Branches & III Sem — **Weightage**: 20%

Instruction:

(i) *Read the questions properly and answer accordingly.*

(ii) *Question paper consists of 3 parts.*

(iii) Scientific and Non-programmable calculators are permitted.

Part A

Answer **all** the Questions. **Each** question carries **four** marks. (3x4=12)

1. Find the Z-transform of $\sin(3n+5)$

2. Find the DTFT of $\delta(n+3)-\delta(n-3)$

3. Write a difference equation that characterizes a system whose frequency response is

$$H(\omega)=\frac{1-e^{-j\omega}-e^{-j2\omega}}{1+(1/3)e^{-j\omega}+(1/6)e^{-j2\omega}}$$

Part B

Answer **all** the Questions. **Each** question carries **eight** marks. (2x8=16)

4. If $U(z)=\dfrac{2z^2+3z+12}{(z-1)^4}$, find the values of $u_0,u_1,u_2\,\&\,u_3$ using Initial value theorem.

5. Use the FFT algorithm to compute the Fourier transform of the sequence {1, 2, 1, 0}

Part C

Answer any one Question. Question carries **twelve** marks. (1x12=12)

6. Solve the difference equation $u_{n+2}+4u_{n+1}+3u_n=3^n$ with $u_0=0, u_1=1$ by using Z-transforms.

7 a). Using properties, find the DTFT of $n\left(\dfrac{1}{2}\right)^n u(n)$

b). Let X(k) be a 12-point DFT of length 12 real sequence x(n). The first 7 samples of X(k) are given by $X(0)=8,\ X(1)=-1+j2,\ X(2)=2+j3,\ X(3)=1-j4,\ X(4)=-2-j2,$ $X(5)=3+j,\ X(6)=-1-j3$. Determine the remaining samples of X(k).

Roll No.

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SCHOOL OF ENGINEERING

SET B

END TERM FINAL EXAMINATION

Odd Semester: 2018-19

Course Code: MAT 103

Course Name: Engineering Mathematics - III

Programme & Sem: Common to all & III Sem

Date: 26 December 2018

Time: 2 Hours

Max Marks: 80

Weightage: 40%

Instructions:

(i) *Read the question properly and answer accordingly.*
(ii) *Question paper consists of 3 parts.*
(iii) *Scientific and Non-programmable calculators are permitted*

Part A

Answer **all** the Questions. **Each** question carries **eight** marks. (3Qx8M=24)

1. Show that $f(z) = z^2$ is analytic. Hence find its derivative.
2. Find the bilinear transformation that maps the points $\infty, i, 0$ onto $0, i, \infty$.
3. Evaluate $\oint_C \frac{\cos^2 z}{\left(z - \frac{\pi}{6}\right)^3} dz$ where C is the circle $|z| = 1$.

Part B

Answer **all** the Questions. **Each** question carries **ten** marks. (3Qx10M=30)

4. Determine the Laurent's series expansion of the function $f(z) = \frac{1}{(z-1)(z-2)}$ valid in the regions (a). $|z| < 1$ (b). $1 < |z| < 2$.
5. Using Cauchy's integral formula evaluate the integral $\oint_C \frac{e^{2z}}{(z-1)(z-2)} dz$, where C is the circle $|z| = 3$.
6. If $f(z) = u + iv$ is analytic, find $f(z)$ if $u - v = (x - y)(x^2 + 4xy + y^2)$.

Part C

Answer **any two** Questions. **Each** question carries **thirteen** marks. (2Qx13M=26)

7. Find the harmonic conjugate of $v = r^2 \cos 2\theta - r\cos\theta + 2$. Also show that v is harmonic.
8. Discuss the transformation $w = z^2$.
9. Find the residue of $f(z) = \dfrac{\sin \pi z^2 + \cos \pi z^2}{(z-1)^2(z-2)}$ at its poles and hence evaluate $\oint_C f(z)\, dz$ where C is the circle $|z| = 3$.

Roll No.												

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING   SET A

END TERM FINAL EXAMINATION

Odd Semester: 2018-19 | **Date**: 26 December 2018

Course Code: MAT 103 | **Time**: 2 Hours

Course Name: Engineering Mathematics III | **Max Marks**: 80

Programme & Sem: Common to all & III Sem. | **Weightage**: 40%

Instructions:

(i) Read the questions properly and answer accordingly.

(ii) Question paper consists of 3 parts.

(iii) Scientific and Non-programmable calculators are permitted.

Part A

Answer **all** the Questions. **Each** question carries **eight** marks. (3Qx8M=24)

1. Show that $f(z)=\log z$ is analytic everywhere except at $z=0$ and hence find $f'(z)$.

2. Using the Cauchy's integral formula for derivatives evaluate the contour integral
$\oint_C \frac{z^4-3z^2+6}{(z+i)^3}\,dz$, where C is the circle $|z|=2$.

3. Find the bilinear transformation which maps the points $z=0,1,\infty$ of the z plane into the points $w=1,i,-1$ of the w plane.

Part B

Answer **all** the Questions. **Each** question carries **ten** marks. (3Qx10M=30)

4. Prove that, if $f(z)$ is analytic, then $\left(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right)|f(z)|^2=4\,|f'(z)|^2$.

5. Use the Cauchy's integral formula to evaluate the contour integral
$\oint_C \frac{\sin(\pi z^2)+\cos(\pi z^2)}{(z-2)(z-3)}\,dz$, where C is the circle $|z|=4$.

6. Determine the Laurent's series expansion of the function $f(z)=\frac{1}{(z-1)(z-2)}$ valid in the regions (i) $1<|z|<2$ and (ii) $|z|>2$.

Part C

Answer **any two** Questions. **Each** question carries **thirteen** marks. (2Qx13M=26)

7. Show that the function $u = e^{2x}\left[x\cos(2y) - y\sin(2y)\right]$ is harmonic. Hence find its harmonic conjugate.

8. Discuss the transformation $w = e^{z}$ in detail.

9. State the residue theorem on contour integration. Hence evaluate the contour integral

$$\oint_C \frac{z}{(z-1)(z-2)^2}\, dz \text{, where } C \text{ is the circle } |z| = 3.$$