

18MAB201T-CYCLE TEST III

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Questions 50x1=50Marks

Answer all the questions



*

Using Long division method, if $Z^{-1} \left(\frac{1 + 2z^{-1}}{1 - z^{-1}} \right)$ then $f(n)$ is

$$f(n) = \begin{cases} 0 & n = 0 \\ 3 & n \geq 1 \end{cases}$$

☐ Option 1

$$f(n) = \begin{cases} 1 & n = 0 \\ 3 & n \geq 1 \end{cases}$$

☐ Option 2

$$f(n) = \begin{cases} 1 & n = 0 \\ 3 & n > 1 \end{cases}$$

☒ Option 3

$$f(n) = \begin{cases} 1 & n = 0 \\ -3 & n \geq 1 \end{cases}$$

☐ Option 4

*

If $F\{f(x)\} = F(s)$, then $F\{x^2 f(x)\} =$

$$-\frac{d^2}{ds^2}F(s)$$

☒ Option 1

$$\frac{d^2}{ds^2}F(s)$$

☐ Option 2

$$(i)\frac{d^2}{ds^2}F(s)$$

☐ Option 3

$$\frac{d}{ds}F(s)$$

☐ Option 4



*

$$F_c[f(x) \cos ax] =$$

$$\frac{1}{2}[F_s(s+a) + F_s(s-a)]$$

☒ Option 1

$$\frac{1}{2}[F_s(s+a) - F_s(s-a)]$$

☐ Option 2

$$\frac{1}{2}[F_c(s+a) + F_c(s-a)]$$

☐ Option 3

$$\frac{1}{2}[F_c(s+a) - F_c(s-a)]$$

☐ Option 4

*

$$Z[a^{n+6}] =$$

$$\frac{a^6 z}{z - a}$$

☐ Option 1

$$\frac{a^{-6} z}{z - a}$$

☐ Option 2

$$\frac{a^6 z}{z + a}$$

☐ Option 3

$$\frac{z}{z - a}$$

☐ Option 4

*

If $F_s(s)$ is the Fourier sine transform of $f(x)$, then

$$\int_0^{\infty} |f(x)|^2 dx = \int_0^{\infty} |F_s(s)|^2 ds$$

☐ Option 1

$$\int_{-\infty}^{\infty} |f(x)|^2 dx = \int_{-\infty}^{\infty} |F_s(s)|^2 ds$$

☒ Option 2

$$\int_{-\infty}^{\infty} |f(x)| dx = \int_{-\infty}^{\infty} |F_s(s)| ds$$

☐ Option 3

$$\int_0^{\infty} |f(x)| dx = \int_0^{\infty} |F_s(s)| ds$$

☐ Option 4



*

The convolution of two functions $f(x)$ and $g(x)$ is defined as $f * g =$

$$\frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} f(t)g(x-t)dt$$

☒ Option 1

$$\frac{1}{\sqrt{\pi}} \int_{-\infty}^{\infty} f(t)g(x-t)dt$$

☐ Option 2

$$\frac{1}{\sqrt{2\pi}} \int_0^{\infty} f(t)g(x-t)dt$$

☐ Option 3

$$\frac{1}{\sqrt{2}} \int_{-\infty}^{\infty} f(t)g(x-t)dt$$

☐ Option 4



*

$$F_c[xf(x)] =$$

$$\frac{d}{ds}F_s(s)$$

☒ Option 1

$$-\frac{d}{ds}F_s(s)$$

☐ Option 2

$$\frac{d}{ds}F_c(s)$$

☐ Option 3

$$-\frac{d}{ds}F_c(s)$$

☐ Option 4

*

Find Fourier sine transform of $5e^{-2x} + 2e^{-5x}$

$$\sqrt{\frac{2}{\pi}} \left[\frac{5s}{s^2+4^2} + \frac{2s}{s^2+5^2} \right]$$

☒ Option 1

$$\sqrt{\frac{2}{\pi}} \left[\frac{5s}{s^2+4} + \frac{2s}{s^2+25} \right]$$

☐ Option 2

$$\sqrt{\frac{1}{\pi}} \left[\frac{5s}{s^2+4} + \frac{2s}{s^2+25} \right]$$

☐ Option 3

$$\sqrt{\frac{1}{\pi}} \left[\frac{5s}{s^2+4^2} + \frac{2s}{s^2+25^2} \right]$$

☐ Option 4



*

If $f(x) = e^{-x}$, $g(x) = e^{-2x}$ then $\int_0^{\infty} \frac{dx}{(x^2+1)(x^2+4)}$

$$\frac{\pi}{4}$$

☐ Option 1

$$\frac{\pi}{12}$$

☐ Option 2

$$\frac{\pi}{6}$$

☐ Option 3

$$\frac{\pi}{2}$$

☐ Option 4



*

$$F_s\{f(ax)\} =$$

$$\frac{1}{a}F_s\left(\frac{s}{a}\right)$$

☒ Option 1

$$\frac{1}{s}F_s\left(\frac{s}{a}\right)$$

☐ Option 2

$$\frac{1}{s}F_s\left(\frac{a}{s}\right)$$

☐ Option 3

$$\frac{1}{s}F_s\left(\frac{1}{a}\right)$$

☐ Option 4

*

If $Z \{f(n)\} = F(z)$ then the value of $Z [2^n f(n)]$ is

$$F\left(\frac{z}{2}\right)$$

☐ Option 1

$$F\left(\frac{a}{z}\right)$$

☐ Option 2

$$F(2z)$$

☐ Option 3

$$F\left(\frac{2}{z}\right)$$

☐ Option 4



*

Using initial value theorem, if $F(z) = \frac{z}{z-1} + \frac{z}{z^2+1}$ then the value of $f(0)$ is

0☐ Option 1**1**☐ Option 2**2**☐ Option 3**3**☐ Option 4

*

The value of $Z \left\{ \frac{7^n}{n!} \right\}$ is

$$e^{\left(\frac{1}{z}\right)}$$

☐ Option 1

$$e^{\left(\frac{7}{z}\right)}$$

☒ Option 2

$$e^{-\left(\frac{1}{z}\right)}$$

☐ Option 3

$$e^{-\left(\frac{7}{z}\right)}$$

☐ Option 4



*

The value of $Z \left[\frac{1}{8^n} \right]$ is

$$\frac{8z}{z-1}$$

☐ Option 1

$$\frac{z}{8z-1}$$

☐ Option 2

$$\frac{z}{z-1}$$

☐ Option 3

$$\frac{8z}{8z-1}$$

☒ Option 4



*

The value of $Z(a^{n-1})$ is

$$\frac{1}{z-a}$$

☐ Option 1

$$\frac{1}{a} \left(\frac{z}{z+a} \right)$$

☐ Option 2

$$\frac{1}{z+a}$$

☐ Option 3

$$\frac{az}{z+a}$$

☐ Option 4



*

If $Z \{f(n)\} = F(z)$ then $\lim_{z \rightarrow 1} (z - 1)F(z) =$

$$f(0)$$

☐ Option 1

$$f(1)$$

☐ Option 2

$$f(z)$$

☐ Option 3

$$f(\infty)$$

☐ Option 4



*

$$Z^{-1} \left[\frac{1}{z - \frac{1}{3}} \right] =$$

$$3^n - 1$$

☐ Option 1

$$3^{n-1}$$

☐ Option 2

$$\left(\frac{1}{3} \right)^{n-1}$$

☒ Option 3

$$\left(\frac{1}{3} \right)^n$$

☐ Option 4

*

If $Z \{f(n)\} = F(z)$ and $Z \{g(n)\} = G(z)$ then $Z \{f(n) * g(n)\} =$

$$F(z) - G(z)$$

☐ Option 1

$$F(z) + G(z)$$

☐ Option 2

$$F(z)/G(z)$$

☐ Option 3

$$F(z).G(z)$$

☒ Option 4



*

$$Z \{n2^n\} =$$

$$\frac{2z}{(z-2)^2}$$

☒ Option 1

$$\frac{z}{2(z-1)^2}$$

☐ Option 2

$$\frac{2}{(z-2)^2}$$

☐ Option 3

$$\frac{2z}{(z-1)^2}$$

☐ Option 4

*

If $y_{n+1} - 3y_n = 0$ with $y_0 = 1$ then the value of $y(n)$ is

$$3n$$

☐ Option 1

$$3^n$$

☒ Option 2

$$3^{n-1}$$

☐ Option 3

$$2n + 1$$

☐ Option 4



*

The value of $Z \{e^{-7n}\}$ is

$$\frac{z}{z - e^{-7}}$$

☒ Option 1

$$\frac{z}{z + e^{-7}}$$

☐ Option 2

$$\frac{z}{z - e^{-1}}$$

☐ Option 3

$$\frac{z}{z + e^{-1}}$$

☐ Option 4



*

The value of $Z \left\{ \frac{1}{n} \right\}, n \geq 1$ is

$$\log \left(\frac{z}{z-1} \right)$$

☒ Option 1

$$\log \left(\frac{z}{z+1} \right)$$

☐ Option 2

$$\log \left(\frac{z+1}{z} \right)$$

☐ Option 3

$$\log \left(\frac{z-1}{z^2} \right)$$

☐ Option 4



*

$$F_s\{af(x) + bg(x)\} =$$

$$aF_s\{f(x)\} + bF_s\{g(x)\}$$

☒ Option 1

$$F_s\{f(x)\} + F_s\{g(x)\}$$

☐ Option 2

$$aF_s\{f(x)\} + F_s\{g(x)\}$$

☐ Option 3

$$F_s\{f(x)\} + bF_s\{g(x)\}$$

☐ Option 4

*

If $f(n) = \frac{2^{n+1}}{n!}$ then $f(0) =$

0

☐ Option 1

2

☒ Option 2 ∞ ☐ Option 3

1

☐ Option 4

*

Given $f(0) = 0, f(1) = 1, f(2) = -2, f(3) = 3, f(4) = -4, \dots$. Find the general term of the sequence $f(n)$ where $f(n) = Z^{-1}[F(z)]$

$$(-1)^{n-1}n$$

☐ Option 1

$$(-1)^n n$$

☐ Option 2

$$(-1)^{n+1}n^2$$

☐ Option 3

$$(-1)^{n-1}n^2$$

☐ Option 4



*

$$Z[3a^4] =$$

$$\frac{3a^4}{z-1}$$

☐ Option 1

$$\frac{3a^4 z}{z-1}$$

☒ Option 2

$$\frac{3a^4 z}{z+1}$$

☐ Option 3

$$\frac{3z}{z-1}$$

☐ Option 4

*

If $F_s(f(x)) = \frac{e^{-3s}}{s}$, then $f(x)$ is

$$\sqrt{\frac{2}{\pi}} \tan^{-1}\left(\frac{x}{3}\right) + c$$

☐ Option 1

$$\frac{2}{\pi} \tan\left(\frac{x}{3}\right) + c$$

☐ Option 2

$$\sqrt{\frac{2}{\pi}} \tan^{-1}\left(\frac{x}{9}\right) + c$$

☐ Option 3

$$\frac{1}{\sqrt{2\pi}} \tan^{-1}\left(\frac{x^2}{3}\right) + c$$

☐ Option 4



*

The inversion formula for Fourier cosine transform of e^{-ax} , $a > 0$.

$$\int_0^{\infty} \frac{s}{a^2+s^2} ds = \frac{\pi}{2} e^{-ax}$$

☐ Option 1

$$\int_0^{\infty} \frac{s}{a^2+s^2} \sin sx ds = -\frac{\pi}{2} e^{ax}$$

☐ Option 2

$$\int_0^{\infty} \frac{\cos sx}{a^2+s^2} ds = \frac{\pi}{2a} e^{-ax}$$

☐ Option 3

$$\int_0^{\infty} \frac{\cos sx}{a^2+s^2} ds = -\frac{\pi}{2a} e^{ax}$$

☐ Option 4



*

If $F(z) = \frac{5z}{(z-1)(z-2)}$ then the residue of $F(z)z^{n-1}$ at $z = 2$ is

$$5 \cdot 2^{n-1}$$

☐ Option 1

$$5 \cdot \frac{1}{2^n}$$

☐ Option 2

$$5 \cdot 2^n$$

☒ Option 3

$$5 \cdot 2^{n+1}$$

☐ Option 4



*

The infinite Fourier transform of a function $f(x)$ is

$$\frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} f(x) e^{ist} dt$$

☒ Option 1

$$\frac{1}{\sqrt{2\pi}} \int_0^{\infty} f(x) e^{ist} dt$$

☐ Option 2

$$\frac{1}{\sqrt{\pi}} \int_{-\infty}^{\infty} f(x) e^{isx} dx$$

☐ Option 3

$$\frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} f(x) e^{isx} dx$$

☐ Option 4



*

The Fourier cosine transform of e^{-7x} is

$$\sqrt{\frac{1}{\pi}} \frac{7}{7^2 + s^2}$$

☐ Option 1

$$\sqrt{\frac{2}{\pi}} \frac{7}{7^2 + s^2}$$

☒ Option 2

$$\sqrt{\frac{1}{\pi}} \frac{s}{7^2 + s^2}$$

☐ Option 3

$$\sqrt{\frac{2}{\pi}} \frac{s}{7^2 + s^2}$$

☐ Option 4



*

The value of Z -transform of $a^n \cos n\pi$ is

$$\frac{1}{z + a}$$

☐ Option 1

$$\frac{z}{z - a}$$

☐ Option 2

$$\frac{z}{z + a}$$

☐ Option 3

$$\frac{1}{z - a}$$

☐ Option 4



*

$$F\{f(x) * g(x)\} =$$

$$F(s) + G(s)$$

☐ Option 1

$$F(s) - G(s)$$

☐ Option 2

$$F(s).G(s)$$

☐ Option 3

$$F(s)/G(s)$$

☐ Option 4

*

The Fourier transform of $f(x) = e^{-\frac{x^2}{2}}$ is

$$\frac{1}{e^{x^2}}$$

☐ Option 1

$$e^{\frac{s^2}{2}}$$

☐ Option 2

$$e^{s^2}$$

☐ Option 3

$$e^{-\frac{s^2}{2}}$$

☐ Option 4

*

The Fourier sine transform of $\frac{1}{x}$ is

$$\sqrt{\frac{2}{\pi}}$$

☐ Option 1

$$\sqrt{\frac{1}{\pi}}$$

☐ Option 2

$$\sqrt{\frac{\pi}{2}}$$

☒ Option 3

$$\sqrt{\frac{\pi}{4}}$$

☐ Option 4



*

Find the Fourier transform of $f(x) = \begin{cases} 1, & \text{in } |x| < 2 \\ 0, & \text{in } |x| > 2 \end{cases}$

$$\sqrt{\frac{2}{\pi}} \frac{\sin 2x}{x}$$

☐ Option 1

$$\frac{2}{\pi} \frac{\sin 2s}{s}$$

☐ Option 2

$$\sqrt{\frac{2}{\pi}} \frac{\sin 2s}{s}$$

☒ Option 3

$$\frac{1}{\sqrt{2\pi}} \frac{\sin 2s}{s}$$

☐ Option 4

*

$$F_s[f(x) \cos ax] =$$

$$\frac{1}{2}[F_s(s+a) + F_s(s-a)]$$

☐ Option 1

$$\frac{1}{2}[F_s(s+a) - F_s(s-a)]$$

☐ Option 2

$$\frac{1}{2}[F_c(s+a) + F_c(s-a)]$$

☒ Option 3

$$\frac{1}{2}[F_c(s+a) - F_c(s-a)]$$

☐ Option 4

*

The solution of $u_n = 5u_{n-1}$, $n \geq 1$ and $u_0 = 2$ is

$$u_n = 5^n$$

☐ Option 1

$$u_n = 5.2^n$$

☐ Option 2

$$u_n = 2.5^n$$

☒ Option 3

$$u_n = 2^n$$

☐ Option 4



*

Find Fourier cosine transform of $\cosh x - \sinh x$

$$F_c(s) = \sqrt{\frac{2}{\pi}} \left(\frac{1}{s+1} \right)$$

☐ Option 1

$$F_c(s) = \sqrt{\frac{2}{\pi}} \left(\frac{1}{s^2+1} \right)$$

☐ Option 2

$$F_c(s) = \sqrt{\frac{2}{\pi}} \left(\frac{2}{s^2+1} \right)$$

☐ Option 3

$$F_c(s) = \sqrt{\frac{2}{\pi}} \left(\frac{1}{s^2+2} \right)$$

☐ Option 4



*

If $F_s(s), G_s(s)$ are the Fourier sine transforms of $f(x)$ and $g(x)$ respectively, then $\int_0^{\infty} f(x)g(x)dx =$

$$\int_0^{\infty} F_s(s)G_s(s)ds$$

☐ Option 1

$$\int_{-\infty}^{\infty} F_s(s)G_s(s)ds$$

☐ Option 2

$$\int_0^{\infty} G_s(s)ds$$

☐ Option 3

$$\int_0^{\infty} F_s(s)ds$$

☐ Option 4

*

Use initial value theorem, if $F(z) = \frac{10z}{(z-1)(z-2)}$ then the value of $f(0)$ is

1☐ Option 1**2**☐ Option 2**3**☐ Option 3**0**☐ Option 4

*

If $x(n+1) - 2x(n) = 1$ with $x(0) = 0$ then the value of $x(n)$ is

$$2^n + 2$$

☐ Option 1

$$2^n$$

☐ Option 2

$$2^n + 1$$

☐ Option 3

$$2^n - 1$$

☒ Option 4



*

Under Fourier sine transform of $f(x) = \frac{1}{\sqrt{x}}$ is

cosine function

☐ Option 1

self-reciprocal function

☒ Option 2

inverse function

☐ Option 3

complex function

☐ Option 4



*

$$F\{e^{iax} f(x)\} =$$

$$F(s - a)$$

☐ Option 1

$$F(s + a)$$

☒ Option 2

$$F(sa)$$

☐ Option 3

$$F\left(\frac{s}{a}\right)$$

☐ Option 4

*

$$Z^{-1} \left[\frac{5z}{(z-5)^2} \right] =$$

$$5^{n-1}$$

☐ Option 1

$$n5^{n+1}$$

☐ Option 2

$$5^{n+1}$$

☐ Option 3

$$n5^n$$

☒ Option 4

*

If $F\{f(x)\} = F(s)$ and $a > 0$, then the change of scale property is

$$F\{f(ax)\} = \frac{1}{a}F\left(\frac{s}{a}\right)$$

☒ Option 1

$$F\{e^{iax}f(x)\} = F(s+a)$$

☐ Option 2

$$F\{f(x-a)\} = e^{isa}F(s)$$

☐ Option 3

$$F[af(x) + bg(x)] = aF[f(x)] + bF[g(x)]$$

☐ Option 4



*

If $Z \{f(n)\} = F(z)$ then $Z \{f(n - 7)\} =$

$$z^7 F(z)$$

☐ Option 1

$$z^{-7} F\left(\frac{z}{7}\right)$$

☐ Option 2

$$z^{-7} F(z)$$

☐ Option 3

$$z^{-7} F\left(\frac{7}{z}\right)$$

☐ Option 4



*

Find Fourier cosine transform of $3e^{-2x}$

$$\sqrt{\frac{2}{\pi}} \left[\frac{6}{s^2 + 2^2} \right]$$

☒ Option 1

$$\sqrt{\frac{2}{\pi}} \left[\frac{3}{s^2 + 2^2} \right]$$

☐ Option 2

$$\sqrt{\frac{1}{\pi}} \left[\frac{6}{s^2 + 2^2} \right]$$

☐ Option 3

$$\sqrt{\frac{1}{\pi}} \left[\frac{3}{s^2 + 2^2} \right]$$

☐ Option 4

*

If $y_{n+2} + 6y_{n+1} + 9y_n = 2^n$ with $y_0 = y_1 = 0$ then the value of $Z[y(n)] =$

$$\frac{z}{(z-2)(z+3)^2}$$

☒ Option 1

$$\frac{z}{(z+2)(z+3)^2}$$

☐ Option 2

$$\frac{z}{(z-2)(z-3)^2}$$

☐ Option 3

$$\frac{1}{(z-2)(z+3)^2}$$

☐ Option 4



*

The inversion theorem for infinite Fourier sine transform is

$$f(x) = \sqrt{\frac{2}{\pi}} \int_0^{\infty} F_s(s) \sin sx ds$$

☒ Option 1

$$f(x) = \sqrt{\frac{2}{\pi}} \int_{-\infty}^{\infty} F_s(s) \sin sx ds$$

☐ Option 2

$$f(x) = \frac{2}{\pi} \int_0^{\infty} F_s(s) \sin sx ds$$

☐ Option 3

$$f(x) = \frac{2}{\sqrt{\pi}} \int_0^{\infty} F_s(s) \sin sx ds$$

☐ Option 4

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