I B. Tech. - II semester

(19BT2BS01) **TRANSFORMATION TECHNIQUES AND LINEAR ALGEBRA**

(Common to EEE, ECE, EIE, CE, ME, CSE, CSSE & IT)

MID-I (QUESTION BANK)

Question 1 Which of the following is an even function of x ? (A) x^2 (B) x^2-4x (C) $\sin(2x)+3x$ (D) x^3+6 **Ans:A**	Easy
Question 2 A periodic function $f(x)$ with period T satisfies (A) $f(x+T)=f(2x)$ (B) $f(x+2T)=f(x)$ (C) $f(x+T)=-f(x)$ (D) $f(x+T)=-f(2x)$ **Ans:B**	Easy
Question 3 If $f(x)=\frac{a_0}{2}+\sum_{n=1}^{\infty}a_n \cos nx+\sum_{n=1}^{\infty}b_n \sin nx$ then the value of b_n where $x\in(0,2\pi)$ is (A) $\frac{1}{\pi}\int_0^{2\pi} f(x)\,dx$ (B) $\frac{1}{\pi}\int_0^{2\pi} f(x)\sin nx\,dx$ (C) $\frac{2}{\pi}\int_0^{2\pi} f(x)\cos nx\,dx$ (D) $\frac{2}{\pi}\int_0^{\pi} f(x)\sin nx\,dx$ **Ans:B**	Easy

Question 4 If $f(x)=\mathrm{e}^{-x}$ in (-1,1) then the value of a_0 is (A) 0 (B) $2\cosh 1$ (C) $2\sinh 1$ (D) 2 **Ans:C**	Medium
Question 5 If $f(x)$ is even function in $(-l,l)$ then the Fourier coefficient b_n is (A) $\frac{2}{l}\int_0^l f(x)\sin\frac{n\pi x}{l}dx$ (B) $\frac{1}{l}\int_0^l f(x)\cos\frac{n\pi x}{l}dx$ (C) $\frac{2}{l}\int_0^l f(x)\,dx$ (D) 0 **Ans:D**	Easy
Question 6 The finite Fourier cosine transform of $f(x)=1$, where $0<x<\pi$ is (A) $\frac{1-(-1)^n}{n}$ (B) 0 (C) $\frac{1+(-1)^n}{n}$ (D) $1-(-1)^n$ **Ans:B**	Medium
Question 7 The Fourier sine transform of e^{-ax} is (A) $\frac{a}{p^2+a^2}$ (B) $\frac{p}{p^2-a^2}$	Easy

(C) $\frac{1}{p^2+a^2}$ (D) $\frac{p}{p^2+a^2}$ **Ans:D**	
Question 8 If $f(x)\begin{cases}1 & if \quad 0\le x\le a\\ 0 & if \quad x>a\end{cases}$ then the value of Fourier cosine transform $F_C[\,f(x)\,]=$ (A) $\frac{\sin sa}{s}$ (B) $\frac{\cos sa}{s}$ (C) $\frac{e^{as}}{s}$ (D) $\frac{1}{s}$ **Ans:A**	Easy
Question 9 At the point of discontinuity $x=0$, the limit of the function $f(x)$ can be defined as (A) $\frac{1}{2}[f(x+0)-f(x-0)]$ (B) $\frac{1}{2}[f(x+0)+f(x-0)]$ (C) $\frac{1}{4}[f(x+0)-f(x-0)]$ (D) $\frac{1}{4}[f(x+0)+f(x-0)]$ **Ans:B**	Easy
Question 10 Which of the following is not Dirichlet's condition for the Fourier series expansion? (A) $f(x)$ is periodic, single valued and finite (B) $f(x)$ has finite number of discontinuities in only one period	Easy

(C) $f(x)$ has finite number of maxima and minima (D) $f(x)$ is a non-periodic, single valued and infinite **Ans:D**	
Question 1 1 The value of the Fourier coefficient a_0 for the function $f(x)=x$ in $(0,3)$ is (A) 0 (B) 1 (C) 2 (D) 3 **Ans:D**	Medium
Question 12 For the function $f(x)=x^2$ in $(-2,2)$, the value of the Fourier coefficient a_0 is (A) 4/3 (B) 1/3 (C) 2/3 (D) 8/3 **Ans:D**	Medium
Question 13 The period of $\sin x$ is (A) π (B) 2π (C) $\frac{\pi}{2}$ (D) $\frac{\pi}{3}$ **Ans:B**	Easy
Question 14 If $f(x)=x^3$ where $x\in(-\pi,\pi)$ then the value of the Fourier coefficient a_n is (A) 0 (B) 1	Easy

(C) 2 (D) -1 **Ans:A**	
Question 15 If $f(x)$ can be expanded as a half-range cosine series in $(0,l)$, then the Fourier coefficient a_0 is (A) $\frac{1}{l}\int_0^{2l} f(x)\,dx$ (B) $\frac{2}{l}\int_0^{l} f(x)\,dx$ (C) $\frac{1}{l}\int_{-l}^{l} f(x)\,dx$ (D) $\frac{1}{l}\int_0^{l} f(x)\,dx$ **Ans:B**	Easy
Question 16 The integral $f(x)=\frac{1}{\pi}\int_0^{\infty}\int_{-\infty}^{\infty}\cos p(t-x)\,f(t)\,dt\,dp$ is (A) Fourier Cosine integral (B) Fourier Sine integral (C) Fourier integral theorem (D) None **Ans:C**	Easy
Question 17 Which of the following is an infinite Fourier transform of $f(x)$? (A) $\frac{1}{\pi}\int_{-\infty}^{\infty} f(x)e^{ipx}\,dx$ (B) $\frac{1}{2\pi}\int_{-\infty}^{\infty} f(x)e^{ipx}\,dx$	Easy

(C) $\int_{-\infty}^{\infty} f(x)e^{ipx}\,dx$ (D) $\frac{1}{\pi}\int_{0}^{\infty} f(x)e^{ipx}\,dx$ **Ans:C**	
Question 18 The property $F\left[af(x)+bg(x)\right]=aF(p)+bG(\mathrm{p})$, where $F(p)$ and $\mathrm{G}(p)$ is the Fourier transforms of $f(x)$ and $\mathrm{g}(x)$ is known as (A) Linearity Property (B) First Shifting Property (C) Modulation Property (D) Change of Scale Property **Ans:A**	Easy
Question 19 The value of the integral $\int_{-\pi}^{\pi}\cos mx\,\cos nx\,dx$ when $m=0$ and $n=0$ is (A) 0 (B) π (C) 2π (D) π/2 **Ans:C**	Easy
Question 20 The value of $\int_{-\pi}^{\pi}\sin mx\,\sin nx\,dx$ when $m=n=0$ is (A) 0 (B) π (C) 2π (D) π/2 **Ans:A**	Easy

Question 21 The value of $\cos 2n\pi$ where n is a positive integer is (A) 1 (B) $(-1)^n$ (C) $\left(-\frac{1}{2}\right)^n$ (D) $(\pi)^{-n}$ **Ans:A**	Easy
Question 22 The period of $\tan x$ is (A) π (B) 2π (C) $\frac{\pi}{2}$ (D) $\frac{\pi}{3}$ **Ans:A**	Easy
Question 23 If $f(x)$ is an odd function, then the value of $\int_{-a}^{a} f(x)\,dx$ is (A) $2\int_{0}^{a} f(x)\,dx$ (B) $\int_{0}^{a} f(x)\,dx$ (C) 0 (D) 1 **Ans:C**	Easy
Question 24 For the function $f(x) = x \sin x$ where $x \in (-\pi, \pi)$ then the value of b_n in the Fourier series of $f(x)$ is (A) – 1 (B) 1	Easy

(C) $2\sin 1$ (D) 0 **Ans:D**	
Question 25 The half-range sine series for $f(x)$ in $(0, l)$ is (A) $\sum_{n=1}^{\infty} b_n \sin\frac{n\pi x}{l}$ (B) $\sum_{n=1}^{\infty} a_n \cos\frac{n\pi x}{l}$ (C) $\sin\frac{n\pi x}{l}$ (D) $\cos\frac{n\pi x}{l}$ **Ans:A**	Easy
Question 26 Which of the following is the Fourier sine integral of $f(x)$? (A) $\int_0^{\infty} \sin px \int_0^{\infty} f(t)\sin pt\, dt\, dp$ (B) $\frac{2}{\pi}\int_0^{\infty} \cos px \int_0^{\infty} f(t)\cos pt\, dt\, dp$ (C) $\frac{2}{\pi}\int_0^{\infty} \sin px \int_0^{\infty} f(t)\sin pt\, dt\, dp$ (D) $\int_0^{\infty} \cos px \int_0^{\infty} f(t)\cos pt\, dt\, dp$ **Ans:C**	Easy
Question 27 The value of $\int_0^{\infty} e^{-2x}\cos x\, dx$ is (A) 2/5 (B) 1/5 (C) 3/5	Medium

(D) 1 **Ans:A**	
Question 28 For the function $f(x)=\|x\|$ in $(-2,2)$, the Fourier coefficient a_0 is (A) 0 (B) -1 (C) 2 (D) -2 **Ans:C**	Medium
Question 29 If $f(x)=\|\cos x\|$, then $f(x)$ is (A) an even function (B) a odd function (C) neither even nor odd (D) cannot be decided **Ans:A**	Easy
Question 30 The value of $\sin n\pi$ where n is a positive integer is (A) 1 (B) $(-1)^n$ (C) $\left(-\frac{1}{2}\right)^n$ (D) 0 **Ans:D**	Easy

Question 31 The value of $L\left[e^{-3t}\right]$ is (A) $\frac{s}{s+3}$ (B) $\frac{1}{s-3}$ (C) $\frac{s}{s-3}$ (D) $\frac{1}{s+3}$ **Ans:D**	Easy
Question 32 If $L[f(t)]=\bar{f}(s)$, then $L\left[e^{-3t}\sin t\right]$ is (A) $\frac{1}{(s+3)^2+1}$ (B) $\frac{s}{(s+3)^2+1}$ (C) $\frac{s}{(s-3)^2+1}$ (D) $\frac{1}{(s-3)^2+1}$ **Ans:A**	Medium
Question 33 The value of $L[\sin t]$ when $s=0$ is (A) 0 (B) 1 (C) 2 (D) 3 **Ans:B**	Easy
Question 34 If $L[\cos t]=\frac{s}{s^2+1}$ then $L\left[\cos\left(\frac{t}{3}\right)\right]$ is (A) $\frac{3s}{3s^2+1}$ (B) $\frac{9s}{3s^2+1}$	Medium

(C) $\dfrac{9s}{9s^2+1}$ (D) $\dfrac{3s}{3s^2-1}$ **Ans:C**	
Question 35 If $L[f(t)]=\bar{f}(s)$, then $L\left[\dfrac{f(t)}{t}\right]$ is (A) $\int_0^t \bar{f}(s)\,ds$ (B) $\int_0^t s\,\bar{f}(s)\,ds$ (C) $\int_s^\infty \bar{f}(s)\,ds$ (D) $\int_0^\infty \bar{f}(s)\,ds$ **Ans:C**	Easy
Question 36 The value of $L[t\sin t]$ is (A) $\dfrac{2s}{\left(s^2+1\right)^2}$ (B) $\dfrac{s}{\left(s^2+1\right)^2}$ (C) $\dfrac{2s}{\left(s^2-1\right)^2}$ (D) $\dfrac{2}{\left(s^2+1\right)^2}$ **Ans:A**	Medium
Question 37 Laplace transform of function $f(t)=t^3$ where $t\geq 0$ is (A) $\dfrac{3}{s^4}$ (B) $\dfrac{6}{s^3}$ (C) $\dfrac{3}{s^3}$	Easy

(D) $\frac{6}{s^4}$ **Ans:D**	
Question 38 If $L\left[e^{-at}\right]=\frac{1}{s+a}$, then $L\left[\int_0^t e^{-at}dt\right]$ is (A) $\frac{1}{s+a}$ (B) $\frac{1}{s(s+a)}$ (C) $\frac{1}{s(s-a)}$ (D) $\frac{1}{s-a}$ **Ans:B**	Easy
Question 39 The period of $\cos 2t$ is (A) π (B) 2π (C) $\frac{\pi}{2}$ (D) none of these **Ans:A**	Easy
Question 40 The value of the integral $\int_0^\infty e^{-t}\cos 3t\,dt$ by using Laplace transform is (A) $\frac{1}{10}$ (B) 10 (C) $\frac{3}{10}$ (D) $\frac{10}{3}$ **Ans:A**	Medium

Question 41 The Laplace transform of $\cos 3t$ is (A) $\frac{s}{s^2+9}$ (B) $\frac{s}{s^2-9}$ (C) $\frac{3}{s^2+9}$ (D) $\frac{3}{s^2-9}$ **Ans:A**	Easy
Question 42 If $L\left[f(t)\right]=\bar{f}(s)$, then $L\left[t^n f(t)\right]$ is (A) $(-1)^{n+1}\frac{d^n}{ds^n}\left[\bar{f}(s)\right]$ (B) $\frac{d^n}{ds^n}\left[\bar{f}(s)\right]$ (C) $(-1)^{n}\frac{d^n}{ds^n}\left[\bar{f}(s)\right]$ (D) $(-1)^{n-1}\frac{d^n}{ds^n}\left[\bar{f}(s)\right]$ **Ans:C**	Easy
Question 43 The value of $\Gamma\left(\frac{3}{2}\right)$ is (A) $\frac{\sqrt{\pi}}{2}$ (B) $\sqrt{\pi}$ (C) $2\sqrt{\pi}$ (D) $-\frac{\sqrt{\pi}}{2}$ **Ans:A**	Easy

Question 44 The Laplace transform of $e^{-t}\cos 2t$ is (A) $\frac{s}{s^2+4}$ (B) $\frac{s-1}{s^2+2s+5}$ (C) $\frac{s+1}{s^2-2s-5}$ (D) $\frac{s+1}{s^2+2s+5}$ **Ans:D**	Medium
Question 45 If $L\left[f(t)\right]=\bar{f}(s)$ then $L\left[\int_0^t f(u)du\right]$ is (A) $\bar{f}(s)$ (B) $\frac{1}{s}\bar{f}(s)$ (C) $\frac{1}{s^2}\bar{f}(s)$ (D) $\frac{1}{s^3}\bar{f}(s)$ **Ans:B**	Easy
Question 46 The Laplace transform of $t^{3/2}$ is $\frac{3\sqrt{\pi}}{4s^{5/2}}$. Then $L\left[e^{-t}t^{3/2}\right]$ is (A) $\frac{\sqrt{\pi}}{4s^{5/2}}$ (B) $\frac{3\sqrt{\pi}}{4(s+1)^{5/2}}$ (C) $\frac{\sqrt{\pi}}{4(s+1)^{5/2}}$ (D) $\frac{3\sqrt{\pi}}{4s^{5/2}}$ **Ans:B**	Easy

Question 47 The value of $L\left[\int_0^t \cosh 2t\, dt\right]$ (A) $\frac{1}{s^2-4}$ (B) $\frac{1}{s}$ (C) $\frac{1}{s\left(s^2-4\right)}$ (D) $\frac{1}{s^2\left(s^2-4\right)}$ **Ans:A**	Easy
Question 48 If $L\left[\frac{1-\cos at}{t}\right]=\frac{1}{2}\log\left(\frac{s^2+a^2}{s^2}\right)$; then the value of $L\left[\frac{1-\cos t}{t}\right]$ is (A) $\log\left(\frac{s^2+1}{s^2}\right)$ (B) $\frac{1}{2}\log\left(\frac{s^2+1}{s^2}\right)$ (C) $\log\left(\frac{1}{s^2}\right)$ (D) $\frac{1}{2}\log\left(\frac{s^2+1}{s^2+2}\right)$ **Ans:B**	Easy
Question 49 If $\lim_{t\to\infty} e^{-3t}\, t^2 = 0$ *then* the function $f(t)=t^2$ is of (A) exponential order 0 (B) exponential order 2 (C) exponential order 3 (D) is not of exponential order **Ans:C**	Easy

Question 50 The Laplace transform of $\sinh at$ is (A) $\frac{s}{s^2+a^2}$ (B) $\frac{a}{s^2+a^2}$ (C) $\frac{1}{s^2+a^2}$ (D) $\frac{a}{s^2-a^2}$ **Ans:D**	Easy
Question 51 If $L[f(t)]=\bar{f}(s)$ and $L[g(t)]=\bar{g}(s)$ then $L[c_1 f(t)+c_2 g(t)]$ is (A) $c_1\bar{f}(s)+c_2\bar{g}(s)$ (B) $\frac{1}{c_1}\bar{f}(s)+\frac{1}{c_2}\bar{g}(s)$ (C) $L\{c_1 f(t)\}.L\{c_2 g(t)\}$ (D) $c_1\bar{f}(s).c_2\bar{g}(s)$ **Ans:A**	Easy
Question 52 The value of $L\left[e^{2t}+4t^3\right]$ is (A) $\frac{s}{s+2}+\frac{9}{s^3}$ (B) $\frac{1}{s-2}+\frac{11}{s^4}$ (C) $\frac{1}{s-2}+\frac{24}{s^4}$ (D) $\frac{1}{s+2}+\frac{4}{s^4}$ **Ans:C**	Easy

Question 53 The Laplace transform of $f(t)$ is $\bar{f}(s)$, then the Laplace transform of $f(at)$ is (A) $a\,\bar{f}\left(\frac{s}{a}\right)$ (B) $a\,\bar{f}(as)$ (C) $\frac{1}{a}\,\bar{f}(as)$ (D) $\frac{1}{a}\,\bar{f}\left(\frac{s}{a}\right)$ **Ans:D**	Easy
Question 54 The value of $L\left[\int_0^t t^2 dt\right]$ (A) $\frac{2}{s^4}$ (B) $\frac{1}{s^4}$ (C) $\frac{2}{s^3}$ (D) $\frac{1}{s^3}$ **Ans:A**	Medium
Question 55 If $L(\cos 2t) = \frac{s}{s^2+4}$ *then* $L(t\cos 2t) =$ (A) $\frac{s^2-4}{\left(s^2+4\right)^2}$ (B) $\frac{s^2-3}{\left(s^2+3\right)^2}$ (C) $\frac{2s}{\left(s^2+4\right)^2}$ (D) $\frac{4s}{\left(s^2+4\right)^2}$ **Ans:A**	Easy

Question 56 The Laplace Transform of unit step function $u(t-a)$ is (A) $\frac{e^{-as}}{s}$ (B) e^{-as} (C) $s.e^{-as}$ (D) $\frac{e^{-as}}{s^2}$ **Ans:A**	Easy
Question 57 If $L[f(t)]=\bar{f}(s)$ then $L\left[e^{at}f(t)\right]$ is equal to (A) $\bar{f}(s-a)$ (B) $\bar{f}(s+a)$ (C) $a\ \bar{f}(s)$ (D) $\frac{1}{a}\ \bar{f}(s)$ **Ans:A**	Easy
Question 58 The Laplace transform of $f(t)$ is $\bar{f}(s)$ then the Laplace transform of $f'(t)$ is (A) $s\ \bar{f}(s)$ (B) $s^2\ \bar{f}(s)$ (C) $s\ \bar{f}(s)-f(0)$ (D) $s^2\ \bar{f}(s)-sf(0)$ **Ans:C**	Easy
Question 59 Given that $\Gamma\left(\frac{1}{2}\right)=\sqrt{\pi}$, the value of $L\left[\frac{1}{\sqrt{t}}\right]$ is (A) $\frac{\pi}{s}$ (B) $\sqrt{\frac{\pi}{s}}$ (C) $\frac{\sqrt{\pi}}{s}$	Medium

(D) $s.\sqrt{\pi}$ **Ans:B**	
Question 60 If $L[f(t)]=\bar{f}(s)$ and $g(t)=\begin{cases} f(t-a), & t>a \\ o, & t<a \end{cases}$ then $L[g(t)]$ is (A) $e^{s}\ \bar{f}\left(\frac{s}{a}\right)$ (B) $e^{-as}\bar{f}(s)$ (C) $\frac{1}{a}\bar{f}(as)$ (D) $\frac{1}{a}\bar{f}\left(\frac{s}{a}\right)$ **Ans:B**	Easy