SAMPLE QUESTIONS SET

Subject: Applied Mathematics III

Course: CBCGS H

SE ELEX Branch

Q.1 If f(t) be a function, $t \geq 0$, then L[f(t)] defined as

(a) $\int_{-\infty}^{\infty} e^{st} f(t)dt$ (b) $\int_{-\infty}^{\infty} e^{st} f(t)dt$

(c) $\int_{0}^{\infty} e^{st} f(t)dt$ (d) $\int_{0}^{\infty} e^{-st} f(t)dt$

Q.2 Find L $[1+e^{-2t} + \sin 2t]$

(a) $\frac{1}{s}+\frac{1}{s-2}+\frac{1}{s^2-2^2}$ (b) $\frac{1}{s}+\frac{1}{s+2}+\frac{s}{s^2-2^2}$

(c) $\frac{1}{s}+\frac{1}{s-2}+\frac{2}{(s^2+2^2)}$ (d) $\frac{1}{s}+\frac{1}{s+2}+\frac{2}{s^2+2^2}$

Q.3 If L{f(t)} = F(s), then L{f(at)} = $\frac{1}{a}F\left(\frac{s}{a}\right)$ known as

(a) First shifting theorem (b) Second shifting theorem

(c) Change of scale property (d) Multiplication theorem

Q.4 If f(t) be a periodic function with period T>0, then L(f(t)) is

(a) $\int_{0}^{T} e^{-st} f(t)dt$ (b) $\frac{\int_{0}^{T} e^{-st} f(t)dt}{1+e^{sT}}$

(c) $\frac{\int_{0}^{T} e^{-st} f(t)dt}{1-e^{sT}}$ (d) $\frac{\int_{0}^{T} e^{-st} f(t)dt}{1-e^{-sT}}$

Q.5 . If $L^{-1}[F(s)] = f(t)$ and $L^{-1}[G(s)] = g(t)$ then $L^{-1}[F(s).G(s)]$ is

(a) $\int_0^t f(x)g(t+x)dx$ (b) $\int_0^x f(x)g(t-x)dt$

(c) $\int_0^t f(x)g(t-x)dx$ (d) $\int_0^x f(x)\,g(t+x)dt$

Q.6 Find the Fourier transform of f(x) = e^{-2x}

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

(c) $\frac{1}{\sqrt{2\pi}}\int_{-\infty}^{\infty} e^{-2x}\,e^{isx}dx$ (d) $\frac{1}{\sqrt{2\pi}}\int_{-\infty}^{\infty} e^{-2ix}\,e^{-isx}dx$

Q.7 Fourier Transform of f(x) reduces to Fourier Cosine transform of f(x) when

(a) f(x) is even function (b) f(x) is odd function

(c) f(x) is neither even nor odd function (d) not depends on function

Q. 8 If $\{f(k)\}=\begin{cases}4^k & for\ k<0\\ 3^k & for\ k\geq 0\end{cases}$, find $Z\{f(k)\}$

(a) $\frac{z}{(4-z)(z-3)}$ *if* $3<|z|<4$ (b) $\frac{z-2}{(4-z)(z-3)}$ *if* $0<|z|<4$

(c) $\frac{1}{(4-z)(z-3)}$ *if* $3<|z|<4$ (d) $\frac{1}{(4-z)(z-3)}$ *if* $0<|z|<\infty$

Q.9. If from the function $f(t)$ one forms of the function $\psi(t)=f(t)+f(-t)$ then $\psi(t)$ is

(a) Even (b) Odd

(c) Neither even nor odd (d) Both even and odd.

Q.10. The trigonometric Fourier series of an even function does not have

(a) Constant (b) Cosine terms

(c) Sine terms (d) Odd.

Q.11. The function $f_3(x)=-1+a\,x+bx^2$ is orthogonal to functions $f_1(x)=1$ and $f_2(x)=x$ in the interval (-1, 1). The value of b will be

(a) 3 (b) -3

(c) 0 (d) 1

Q.12. Fourier series of odd function only have

(a) Constant (b) Cosine terms

(c) Sine terms (d) Odd.

Q.13. For standard Fourier series $\frac{1}{2l}\int_{c}^{c+2l} f(x)\,dx =$

(a) a0 (b) an

(c) bn (d) None of these.

Q.14. In Fourier expansion of f(x)=x^2 for the interval (0, 2 π) find bn =

(a) $2\pi/n$ (b) $4\pi^2/3$

(c) $4\pi/n$ (d) $4/n^2$

Q.15 Function cannot be expressed as Fourier series if it is

(a) Single valued (b) multiple valued

(c) Positive valued (d) negative valued

Q.16. Find $\boldsymbol{a_0}$ the Fourier series for $f(x) = 0, \quad -\pi < x < 0$

$= \sin x, \; 0 < x < \pi$.

(a) $1/\pi$ (b) 0

(c) $\pi/n(n+1)$ (d) $\frac{1}{4n^2}$

Q.17 Find $\boldsymbol{b_n}$ (for n is even)half range sine series of $f(x) = 2x - x^2$ in the interval 0 < x < 2

(a) $32/n^3\pi^3$ (b) 0

(c) $\frac{16}{n^3\pi^3}$ [1- cos n π] (d) $\frac{-16}{n^3\pi^3}$ [1- cos n π]

Q.18. By Greens theorem

(a) $\int_c Pdx + Qdy = \iint_R \left(\frac{\partial Q}{\partial x} - \frac{\partial P}{\partial y}\right)dxdy$ (b) $\int_c Pdx - Qdy = \iint_R \left(\frac{\partial P}{\partial x} - \frac{\partial Q}{\partial y}\right)dxdy$

(c) $\iint_R Pdx - Qdy = \int_c \left(\frac{\partial P}{\partial x} - \frac{\partial Q}{\partial y}\right)dxdy$ (d) None

Q.19. According to Greens theorem formula for the area is

(a) $\frac{1}{2}\int_c (ydx - xdy)$ (b) $\frac{1}{2}\int_c (xdx + ydy)$

(c) $\frac{1}{2}\int_c xydxdy$ (d) None

Q.20. Evaluate $\int_c (2ydx + 3xdy)$ where $c: x^2 + y^2 = 4$

(a) 2π (b) 5π (c) 4π (d) None

Q.21. Find L(y) of differential Equation $(D^2 + 2D + 5)y = e^{-t}\sin t, with\ y(0) = 0, y'(0) = 1$

(a) $\frac{(s^2+2s+3)}{(s^2+2s+5)(s^2+2s+2)}$

(b) $\frac{(s^2-2s+5)}{(s^2+2s+3)(s^2+2s+2)}$

(c) $\frac{(s^2-2s+3)}{(s^2-2s+5)(s^2-2s+2)}$

(d) $\frac{(s^2+2s+3)}{(s^2+5)(s^2+2)}$

Q.22. Find $L^{-1}\left[\frac{s+2}{s^2-4s+13}\right]$

(a) $e^{2t}\cos 3t + 4\,e^{2t}\sin 3t$

(b) $3\,e^{2t}\cos 3t + 4\,e^{2t}\sin 3t$

(c) $e^{2t}\cos 3t + \frac{4}{3}\,e^{2t}\sin 3t$

(d) $e^{-2t}\cos 3t + \frac{4}{3}\,e^{-2t}\sin 3t$

Q.23. Find $L[te^{3t}\sin 4t]$

(a) $\frac{8(s-3)}{(s^2-6s+25)^2}$

(b) $\frac{(2s-6)}{(s^2-6s+10)^2}$

(c) $\frac{2(s+3)}{(s^2-6s+25)^2}$

(d) $\frac{8(s-3)}{(s^2-6s+10)^2}$

Q.24 Find the Z-Transform of $\{ke^{-ak}\}$, k≥ 0.

(a) $\frac{a\,e^{a}.z}{(e^{a}.z-1)^2}$

(b) $\frac{e^{a}.z-1}{(e^{a}.z-1)^2}$

(c) $\frac{k\,e^{a}.z}{(e^{a}.z-1)^2}$

(d) $\frac{e^{a}.z}{(e^{a}.z-1)^2}$

Q.25 Find the inverse Z-transform of

$F(z)=\frac{1}{(z-3)(z-2)}$ if R.O.C. is $|z|<2$

(a) $Z^{-1}[F(z)]=-3^{k-1}+2^{k-1}\ ,\ \ k\le 0$

(b) $Z^{-1}[F(z)]=3^{k-1}+2^{k-1}\ ,\ \ k\le 0$

(c) $Z^{-1}[F(z)]=-3^{k-1}-2^{k-1}\ ,\ \ k\le 0$

(d) $Z^{-1}[F(z)]=-3^{k-1}+2^{k-1}\ ,\ \ k\ge 0$

Q.26 Let u=(4,1,2,3), v=(0,3,8,-2) and w=(3,1,2,2), Find $\|3u-5v+w\|$

(a) $\sqrt{1811}$ (b) $\sqrt{77}$

(c) $\sqrt{1801}$ (d) $\sqrt{1411}$

Q.27 The inner product of u = (-2, 4, 0, -3) and v = (3, 4, 6, -4) are

a) 20 b) 22 c) 16 d) none of these

Q.28 If $\|u+v\|$=6 and $\|u-v\|$=4, u .v is

a) 0 b) 2 c) 5 d) none of these

Q.29 The angle between the vectors u = (6, 2, 2) and v = (3, 0, -9) are

a) 0 b) $\pi/2$ c) π d) none of these

Q.30 Find Euclidean distance between u=(3,-5,4) and v=(6,2,-1).

(a) $\sqrt{83}$ (b) $\sqrt{77}$

(c) $\sqrt{183}$ (d) 1

Q.31 The eigen values of the matrix $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$ are

$(a)\quad 0,0,0 \quad (b)\quad 0,0,1 \quad (c)\quad 0,0,3 \quad (d)\quad 1,1,1$

Q.32 The minimum and maximum eigen values of the matrix $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$ are -2 and 6 respectively.

What is the other eigen value?

$(a)\quad 5 \quad (b)\quad 3 \quad (c)\quad 1 \quad (d)\quad -1$

Q.33 Which of the following matrices is not diagonalizable?

$(a)\ \begin{bmatrix} 1 & 1 \\ 1 & 2 \end{bmatrix}$ $(b)\ \begin{bmatrix} 1 & 0 \\ 3 & 2 \end{bmatrix}$ $(c)\ \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$ $(d)\ \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$

Q.34. The sum of eigen values of the matrix $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$ is

$(a)\ 5$ $(b)\ 7$ $(c)\ 9$ $(d)\ 18$