SAMPLE QUESTIONS SET

Subject: Applied Mathematics III

Course: CBCGS/CBGS

SE: E&TC Branch

Q.1 If f(t) be a function, t≥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. *What is the maximum directional derivative of* $\phi = x^2yz^3$ *at* $(2,1,-1)$?

(a) $\sqrt{171}$ (b) $\sqrt{176}$ (c) $\sqrt{129}$ (d) *None*

Q.7. *Find* $\nabla\phi$ *if* $\phi = xyz$ *at* $(1,2,3)$

(a) $6i-3j+2k$ (b) $6i+3j-2k$ (c) $6i+3j+2k$ (d) *None*

Q.8. *If* $\overline{F}$ *is irrotational vector field; then ....*

(a) $Curl\,\overline{F}=0$ (b) $Div.\overline{F}=0$ (c) $Grad.\overline{F}=0$ (d) *None*

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 $f_3(x)=-1+ax+bx^2$ 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) None of these.

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, $-\pi < x < 0$

= 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. Bessel's equation of order n is

a) $x^2\frac{d^2y}{dx^2} - x\frac{dy}{dx} + (x^2 - n^2)y = 0$

b) $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + (x^2 - n^2)y = 0$

c) $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} - (n^2 + x^2)y = 0$

d) $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + (n^2 - x^2)y = 0$

Q19. Modified Bessel's equation of order n is

$a)\quad x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} - (i^2x^2 - n^2)y = 0$

$b)\quad x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + (i^2n^2 + x^2)y = 0$

$c)\quad x^2\frac{d^2y}{dx^2} - x\frac{dy}{dx} - (i^2x^2 + n^2)y = 0$

$d)\quad x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + (i^2x^2 - n^2)y = 0$

Q20. For positive integer n, a function ……… is called the Generating function of Bessel's coefficients.

a) $e^{\frac{2}{x}(t-\frac{1}{t})}$ b) $e^{\frac{x}{2}(t+\frac{1}{t})}$ c) $e^{x(t-\frac{1}{t})}$ d) $e^{\frac{x}{2}(t-\frac{1}{t})}$

Q21. $\frac{1}{\pi}\int_0^{\pi} \cos(x\sin\theta - n\theta)d\theta =$ …….

a) $J_{n+1}(x)$ b) $J_n(x)$ c) $2J_n(x)$ d) $J_{n-1}(x)$

2. If $\bar{a} = 2i+3j-4k$; $\bar{b}=4i+6j-8k$ then $\bar{a}\times\bar{b} = ?$

(a) 58 (b) 48 (c) 0 (d) None

Q.22. If $\bar{a}, \bar{b}, \bar{c}$ are coplanar then $[\bar{a}\ \bar{b}\ \bar{c}] = ?$

(a) 0 (b) 1 (c) -1 (d) None

Q.23. What is the value of $(\bar{a}\times\bar{b})\times(\bar{c}\times\bar{d}) = ?$

(a) $[\bar{a}\ \bar{b}\ \bar{d}]\bar{c} - [\bar{a}\ \bar{b}\ \bar{c}]\bar{d}$ (b) $[\bar{a}\ \bar{b}\ \bar{c}]\bar{d} - [\bar{a}\ \bar{b}\ \bar{d}]\bar{c}$

(c) $[\bar{b}\ \bar{c}\ \bar{d}]\bar{a} - [\bar{a}\ \bar{c}\ \bar{d}]\bar{b}$ (d) $[\bar{a}\ \bar{c}\ \bar{d}]\bar{b} - [\bar{a}\ \bar{b}\ \bar{d}]\bar{c}$

Q.24. 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.25. By stokes theorem

(a) $\int_c \vec{F}.d\vec{r} = \iint_s \left(\nabla \times \vec{F}\right).d\vec{s}$

(b) $\int_c \vec{F} \times d\vec{r} = \iint_s \left(\nabla . \vec{F}\right).d\vec{s}$

(c) $\int_c \vec{F} \times d\vec{s} = \iint_s \left(\nabla . \vec{F}\right).d\vec{r}$

(d) None

Q.26. According to Greens theorem formula for the area is

(a) $\frac{1}{2}\int_c \left(ydx - xdy\right)$

(b) $\frac{1}{2}\int_c \left(xdx + ydy\right)$

(c) $\frac{1}{2}\int_c xydxdy$

(d) None

Q.27. Evaluate $\int_c \left(2ydx + 3xdy\right)$ where $c: x^2 + y^2 = 4$

(a) 2π (b) 5π (c) 4π (d) None

Q.28. 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.29. 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.30. 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) $\frac{8(s-3)}{(s^2-6s+10)^2}$