

8. The fourier constant term a_0 of $f(x) = (2\pi - x)$ in $(0, 2\pi)$ CO4-App
 (a) π^2 (b) 3π (c) -3π (d) 2π
9. If $F[f(x)] = F(s)$, then $F[ax]$, $a > 0$ CO6-U
 (a) $aF\left(\frac{a}{s}\right)$ (b) $\frac{1}{a}F\left(\frac{s}{a}\right)$ (c) $aF\left(\frac{s}{a}\right)$ (d) $\frac{1}{a}F\left(\frac{a}{s}\right)$
10. Fourier Sine transform of e^{-5x} CO5-U
 (a) $\sqrt{\frac{2}{\pi}} \frac{5}{s^2 + 25}$ (b) $\sqrt{\frac{2}{\pi}} \frac{s}{s^2 - 25}$ (c) $\sqrt{\frac{2}{\pi}} \frac{s}{s^2 + 25}$ (d) $\sqrt{\frac{2}{\pi}} \frac{5}{s^2 - 25}$

PART – B (5 x 2= 10Marks)

11. Transform $[(x+2)^2 D^2 + 3(x+2)D + 5]y = 20$ into linear equation with constant coefficient CO1-App
12. If $\vec{F} = (4x - 5y)\vec{i} + (3y + 5z)\vec{j} + (8x + \lambda z)\vec{k}$ is solenoidal find the value of ' λ '. CO2-App
13. Compute $L[(t + 1)^2]$ CO3-App
14. State Dirichlet's conditions CO4-R
15. Find the Fourier cosine transform of e^{-ax} , $a > 0$ CO5-App

PART – C (5 x 16= 80Marks)

16. (a) (i) Solve the method of variation of parameters, CO1-App (8)
 $(D^2 + 1)y = \csc x$
 (ii) Solve the differential equation $(D^2 - 3D - 4)y = e^x \sin x$ CO1- App (8)
- Or
- (b) (i) Solve the differential equation $(D^2 + 5D + 6)y = e^{-x} + \cos 2x$ CO1- App (8)
 (ii) Solve the differential equation CO1- App (8)
 $(x^2 D^2 - 5xD - 8)y = x^2 \cos(\log x)$
17. (a) Verify Divergence theorem for $\vec{F} = 5x^2\vec{i} + 4y^2\vec{j} + 7z^2\vec{k}$ CO2-App (16)
 over the rectangular parallelepiped $0 \leq x \leq 1$, $0 \leq y \leq 1$, $0 \leq z \leq 1$

Or

- (b) Verify Green's theorem for $\int_C (3x - 8y^2)dx + (4y - 6xy)dy$, C is bounded by $X = 0, Y = 0, X + Y = 1$. CO2 -App (16)
18. (a) (i) Find the Laplace transform of $f(t) = \begin{cases} k & , 0 < t < a \\ -k & , a < t < 2a \end{cases}$ and $f(t + 2a) = f(t)$ CO3-App (8)
- (ii) Solve by the convolution theorem $L^{-1} \left[\frac{s}{(s^2 + a^2)^2} \right]$. CO3-App (8)
- Or
- (b) (i) Solve by using L.T. $y'' - 5y' + 6y = e^{-t}$ given that if $y(0) = 0, y'(0) = 0$ CO3-App (8)
- (ii) Solve by using convolution theorem $L^{-1} \left[\frac{s^2}{(s^2 + a^2)(s^2 + b^2)} \right]$ CO3-App (8)
19. (a) Express $f(x) = x^2$ as a Fourier series of period 2π in the interval $0 < x < 2\pi$. CO4-App (16)
- Or
- (b) (i) Compute first two harmonics of the Fourier series for the following data. CO4-App (8)
- | | | | | | | | |
|---|----|----|----|----|----|----|----|
| x | 0 | 2 | 4 | 6 | 8 | 10 | 12 |
| y | 10 | 12 | 20 | 24 | 26 | 17 | 10 |
- (ii) Find the Half range sine series for $f(x) = x$ in $(0, \pi)$ CO4-App (8)

20. (a) Compute the Fourier Transform of $f(x) = \begin{cases} 1-|x| & \text{if } |x| \leq 1 \\ 0 & \text{if } |x| > 1 \end{cases}$ CO5-App (16)

and hence evaluate (i) $\int_0^{\infty} \left(\frac{\sin x}{x}\right)^4 dx$ (ii) $\int_0^{\infty} \left(\frac{\sin x}{x}\right)^2 dx$

Or

(b) Find Fourier sine & cosine transform x^{n-1} and hence Show that CO5- App (16)
 $\frac{1}{\sqrt{x}}$ is self reciprocal under Fourier sine & cosine transform