Modern Education Society's College Of Engineering, Pune-01
Department Of Mathematics
Multiple choice questions on Linear Differential Equations
Engineering Maths III

1 Homogeneous LDE

1. If the roots $m_1, m_2, m_3 \cdots m_n$ of auxillary equation $\phi(D) = 0$ are real and distinct, then distinct, then solution of $\phi(D)y = 0$ is (1)

   A. $c_1e^{m_1x} + c_2e^{m_2x} + \cdots + c_ne^{m_nx}$

   B. $c_1 \cos m_1x + c_2 \cos m_2x + \cdots c_n \cos m_nx$

   C. $m_1e^{c_1x} + m_2e^{c_2x} + \cdots + m_ne^{c_nx}$

   D. $c_1 \sin m_1x + c_2 \sin m_2x + \cdots c_n \sin m_nx$

   Solution:

2. If the roots $m_1, m_2, m_3 \cdots m_n$ of auxillary equation $\phi(D) = 0$are real. If two of these roots are repeated say $m_1 = m_2$ and the remaining roots $m_3, m_4, \cdots m_n$ are distinct then solution of $\phi(D)y = 0$ is (1)

   A. $c_1e^{m_1x} + c_2e^{m_2x} + \cdots + c_ne^{m_nx}$

   B. $c_1 \cos m_1x + c_2 \cos m_2x + \cdots c_n \cos m_nx$

   C. $(c_1x + c_2)e^{m_1x} + c_3e^{m_3x} + \cdots + c_ne^{m_nx}$

   D. $c_1 \sin m_1x + c_2 \sin m_2x + \cdots c_n \sin m_nx$

   Solution:

3. If the roots $m_1, m_2, m_3 \cdots m_n$ of auxillary equation $\phi(D) = 0$ are real. If two of these roots are repeated say $m_1 = m_2 = m_3$ and the remaining roots $m_4, m_5, \cdots m_n$ are distinct then solution of $\phi(D)y = 0$ is (1)

   A. $c_1e^{m_1x} + c_2e^{m_2x} + \cdots + c_ne^{m_nx}$

   B. $c_1 \cos m_1x + c_2 \cos m_2x + \cdots c_n \cos m_nx$

   C. $(c_1x^2 + c_2x + c_3)e^{m_1x} + c_4e^{m_4x} + \cdots + c_ne^{m_nx}$

   D. $c_1 \sin m_1x + c_2 \sin m_2x + \cdots c_n \sin m_nx$

Solution:

4. If $m_1 = \alpha + i\beta$ and $m_2 = \alpha - i\beta$ are two complex roots of auxillary equation of second order DE $\phi(D)y = 0$ then it's solution is, (1)

   A. $e^{\beta x}[c_1 \cos \alpha x + c_2 \sin \alpha x]$

   B. $e^{\alpha x}[c_1 \cos \beta x + c_2 \sin \beta x]$

   C. $c_1 e^{\alpha x} + c_2 e^{\beta x}$

   D. $e^{\alpha x}[(c_1 x + c_2) \cos \beta x + (c_3 x + c_4) \sin \beta x]$

Solution:

5. The solution of differential equation $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = 0$ is, (1)

   A. $c_1 e^{2x} + c_2 e^{3x}$

   B. $c_1 e^{-2x} + c_2 e^{3x}$

   C. $c_1 e^{2x} + c_2 e^{-3x}$

   D. $c_1 e^{-2x} + c_2 e^{-3x}$

Solution:

6. The solution of differential equation $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} - 6y = 0$ is, (1)

   A. $c_1 e^{-x} + c_2 e^{6x}$

   B. $c_1 e^{x} + c_2 e^{-6x}$

   C. $c_1 e^{2x} + c_2 e^{-3x}$

   D. $c_1 e^{-2x} + c_2 e^{-3x}$

Solution:

7. The solution of differential equation $2\frac{d^2y}{dx^2} - \frac{dy}{dx} - 10y = 0$ is, (1)

   A. $c_1 e^{2x} + c_2 e^{\frac{5x}{2}}$

   B. $c_1 e^{-2x} + c_2 e^{\frac{5x}{2}}$

   C. $c_1 e^{2x} + c_2 e^{\frac{-5x}{2}}$

D. $c_1e^{-2x} + c_2e^{\frac{-5x}{2}}$

Solution:

8. The solution of differential equation $\frac{d^2y}{dx^2} - 4y = 0$ is, (1)

A. $(c_1x + c_2)e^{2x}$

B. $c_1e^{-4x} + c_2e^{4x}$

C. $c_1 \cos 2x + c_2 \sin 2x$

D. $c_1e^{-2x} + c_2e^{2x}$

Solution:

9. The solution of differential equation $\frac{d^2y}{dx^2} - \frac{dy}{dx} - 2y = 0$ is, (1)

A. $c_1e^{2x} + c_2e^{x}$

B. $c_1e^{-2x} + c_2e^{x}$

C. $c_1e^{2x} + c_2e^{-x}$

D. $c_1e^{-2x} + c_2e^{-x}$

Solution:

10. The solution of differential equation $2\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 3y = 0$ is, (1)

A. $c_1e^{x} + c_2e^{\frac{3x}{2}}$

B. $c_1e^{-2x} + c_2e^{-3x}$

C. $c_1e^{x} + c_2e^{-\frac{3x}{2}}$

D. $c_1e^{\frac{x}{2}} + c_2e^{\frac{3x}{2}}$

Solution:

11. The solution of differential equation $4\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + y = 0$ is, (1)

A. $c_1e^{\frac{x}{2}} + c_2e^{-\frac{x}{2}}$

B. $(c_1x + c_2)e^{-2x}$

C. $c_1 \cos 2x + c_2 \sin 2x$

D. $(c_1 x + c_2)e^{\frac{x}{2}}$

Solution:

12. The solution of differential equation $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = 0$ is, (1)

A. $c_1 e^{\frac{x}{2}} + c_2 e^{-\frac{x}{2}}$

B. $(c_1 x + c_2)e^{-2x}$

C. $c_1 \cos 2x + c_2 \sin 2x$

D. $(c_1 x + c_2)e^{\frac{x}{2}}$

Solution:

13. The solution of differential equation $\frac{d^3y}{dx^3} - 7\frac{dy}{dx} - 6y = 0$ is, (1)

A. $c_1 e^{x} + c_2 e^{2x} + c_3 e^{3x}$

B. $c_1 e^{-x} + c_2 e^{-2x} + c_3 e^{6x}$

C. $c_1 e^{-x} + c_2 e^{2x} + c_3 e^{x}$

D. $c_1 e^{-x} + c_2 e^{-2x} + c_3 e^{3x}$

Solution:

14. The solution of differential equation $\frac{d^3y}{dx^3} + 2\frac{d^2y}{dx^2} + \frac{dy}{dx} = 0$ is, (1)

A. $c_1 e^{x} + (c_2 x + c_3)e^{2x}$

B. $c_1 e^{x} + c_2 e^{2x} + c_3 e^{3x}$

C. $(c_2 x + c_3)e^{-x}$

D. $c_1 e^{-x} + (c_2 x + c_3)e^{-2x}$

Solution:

15. The solution of differential equation $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = 0$ is, (1)

A. $c_1 e^{2x} + c_2 e^{x}$

B. $c_1e^x + c_2e^{-x}$

C. $(c_1x + c_2)e^{-x}$

D. $(c_1x + c_2)e^x$

Solution:

16. The solution of differential equation $\frac{d^2y}{dx^2} + 6\frac{dy}{dx} + 9y = 0$ is, (1)

A. $c_1e^{-6x} + c_2e^{-9x}$

B. $(c_1x + c_2)e^{-3x}$

C. $(c_1x + c_2)e^{3x}$

D. $c_1e^{3x} + c_2e^{2x}$

Solution:

17. The solution of differential equation $\frac{d^2y}{dx^2} + y = 0$ is, (1)

A. $c_1e^x + c_2e^{-x}$

B. $(c_1x + c_2)e^{-x}$

C. $c_1 \cos x + c_2 \sin x$

D. $e^x(c_1 \cos x + c_2 \sin x)$

Solution:

18. The solution of differential equation $\frac{d^2y}{dx^2} + 6\frac{dy}{dx}y + 10y = 0$ is, (1)

A. $e^{-3x}(c_1 \cos x + c_2 \sin x)$

B. $e^x(c_1 \cos 3x + c_2 \sin 3x)$

C. $c_1e^{5x} + c_2e^{2x}$

D. $e^x(c_1 \cos x + c_2 \sin x)$

Solution:

19. The solution of differential equation $\frac{d^2y}{dx^2} + \frac{dy}{dx}y + y = 0$ is, (1)

A. $e^x(c_1 \cos x + c_2 \sin x)$

B. $e^{x/2}\left(c_1 \cos(\frac{3x}{2}) + c_2 \sin(\frac{3x}{2})\right)$

C. $e^{-x/2}\left(c_1 \cos\left(\frac{\sqrt{3}}{2}\right)x + c_2 \sin\left(\frac{\sqrt{3}}{2}\right)x\right)$

D. $e^x(c_1 \cos x + c_2 \sin x)$

Solution:

20. The solution of differential equation $\frac{d^3y}{dx^3} + 6\frac{d^2y}{dx^2} + 11\frac{dy}{dx} + 6y = 0$ (1)

A. $c_1e^x + c_2e^{2x} + c_3e^{3x}$

B. $c_1e^{-x} + c_2e^{-2x} + c_3e^{-3x}$

C. $c_1e^{-x} + c_2e^{2x} + c_3e^{3x}$

D. $c_1e^{-x} + c_2e^{-2x} + c_3e^{3x}$

Solution:

21. The solution of differential equation $\frac{d^3y}{dx^3} + 5\frac{d^2y}{dx^2} + 8\frac{dy}{dx} - 4y = 0$ (1)

A. $c_1e^x + (c_2x + c_3)e^{2x}$

B. $c_1e^{-x} + c_2e^{-2x} + c_3e^{-3x}$

C. $c_1e^{-x} + c_2e^{2x} + c_3e^{3x}$

D. $c_1e^{-x} + (c_2x + c_3)e^{-2x}$

Solution:

22. The solution of differential equation $\frac{d^3y}{dx^3} + 2\frac{d^2y}{dx^2} + \frac{dy}{dx} = 0$ (1)

A. $c_1 + (c_2x + c_3)e^x$

B. $c_1 + (c_2x + c_3)e^{-x}$

C. $(c_2x + c_3)e^{-x}$

D. $c_1 + c_2e^x + c_3e^{-x}$

Solution:

23. The solution of differential equation $\frac{d^3y}{dx^3} + 2\frac{d^2y}{dx^2} + \frac{dy}{dx} = 0$ (1)

A. $c_1 + (c_2x + c_3)e^x$

B. $c_1 + (c_2x + c_3)e^{-x}$

C. $(c_2x + c_3)e^{-x}$

D. $c_1 + c_2e^x + c_3e^{-x}$

Solution:

24. The solution of differential equation $\frac{d^3y}{dx^3} - 4\frac{dy}{dx} = 0$ (1)

A. $c_1e^{2x} + c_2e^{-2x}$

B. $c_1e^x + c_2e^{-2x} + c_3e^{-3x}$

C. $c_1 + c_2e^{2x} + c_3e^{2x}$

D. $c_1 + c_2\cos 2x + c_3\sin 2x$

Solution:

25. The solution of differential equation $\frac{d^3y}{dx^3} + y = 0$ (1)

A. $c_1e^x + e^x\left(c_2\cos(\frac{3x}{2}) + c_3\sin(\frac{3x}{2})\right)$

B. $c_1e^x + e^{x/2}\left(c_2\cos(\frac{x}{2}) + c_3\sin(\frac{x}{2})\right)$

C. $c_1e^x + e^{-x/2}\left(c_2\cos(\frac{x}{2}) + c_3\sin(\frac{x}{2})\right)$

D. $c_1e^{-x} + e^{x/2}\left(c_2\cos(\frac{x}{2}) + c_3\sin(\frac{x}{2})\right)$

Solution:

26. The solution of differential equation $\frac{d^3y}{dx^3} + \frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 12y = 0$ (1)

A. $c_1e^{-3x} + e^x\left(c_2\cos(\sqrt{3}x) + c_3\sin(\sqrt{3}x)\right)$

B. $c_1e^{-3x} + \left(c_2\cos(\sqrt{3}x) + c_3\sin(\sqrt{3}x)\right)$

C. $c_1e^{3x} + e^{-x}\left(c_2\cos(\sqrt{3}x) + c_3\sin(\sqrt{3}x)\right)$

D. $c_1e^{-x} + c_2e^{-\sqrt{3}x} + c_3e^{\sqrt{3}x}$

Solution:

27. The solution of differential equation $(D^3 - D^2 + 3D + 5)y = 0$ where$D \equiv \frac{d}{dx}$ is, (1)

A. $c_1e^{-x} + e^{x}\left(c_2\cos(2x) + c_3\sin(2x)\right)$

B. $c_1e^{-x} + \left(c_2\cos(2x) + c_3\sin(2x)\right)$

C. $c_1e^{x} + e^{-x}\left(c_2\cos(2x) + c_3\sin(2x)\right)$

D. $c_1e^{-x} + c_2e^{2x} + c_3e^{-3x}$

Solution:

28. The solution of differential equation $(D^3 - D^2 + 4D - 4)y = 0$ where$D \equiv \frac{d}{dx}$ is (1)

A. $(c_1 + c_2x)e^{-2x} + c_3e^{-x}$

B. $c_1e^{x} + c_2\cos 4x + c_3\sin 4x$

C. $c_1e^{x} + c_2\cos 2x + c_3\sin 2x$

D. $c_1e^{x} + c_2e^{2x} + c_3e^{-2x}$

Solution:

29. The solution of differential equation $(D^4 - 1)y = 0$ where$D \equiv \frac{d}{dx}$ is (1)

A. $(c_1 + c_2x)e^{-x} + c_3\cos x + c_4\sin x$

B. $(c_1 + c_2x + c_3x^2 + c_4x^3)e^{x}$

C. $c_1e^{x} + c_2e^{-x} + c_3\cos x + c_4\sin x$

D. $(c_1x + c_2)\cos x + (c_3x + c_4)\sin x$

Solution:

30. The solution of differential equation $(D^4 + 2D^2 + 1)y = 0$, where $D \equiv \frac{d}{dx}$ is (1)

A. $(c_1 + c_2x)e^{-x} + c_3\cos x + c_4\sin x$

B. $(c_1 + c_2x + c_3x^2 + c_4x^3)e^x$

C. $c_1e^x + c_2e^{-x} + c_3\cos x + c_4\sin x$

D. $(c_1x + c_2)\cos x + (c_3x + c_4)\sin x$

Solution:

31. The solution of differential equation $(D^2 + 9)^2y = 0$, where$D \equiv \frac{d}{dx}$ is (1)

A. $(c_1 + c_2x)e^{-x} + c_3\cos x + c_4\sin x$

B. $(c_1 + c_2x + c_3x^2 + c_4x^3)e^{3x}$

C. $(c_1x + c_2)\cos 9x + (c_3x + c_4)\sin 9x$

D. $(c_1x + c_2)\cos 3x + (c_3x + c_4)\sin 3x$

Solution:

32. The solution of differential equation $(D^4 + 8D^2 + 16)y = 0$, where$D \equiv \frac{d}{dx}$ is (1)

A. $c_1e^{2x} + c_2e^{-x} + c_3e^x + c_4e^{-2x}$

B. $(c_1x + c_2)e^{2x} + (c_3x + c_4)e^{-2x}$

C. $(c_1x + c_2)\cos 4x + (c_3x + c_4)\sin 4x$

D. $(c_1x + c_2)\cos 2x + (c_3x + c_4)\sin 2x$

Solution:

33. The solution of differential equation $(D^6 + 6D^4 + 9D^2)y = 0$, where$D \equiv \frac{d}{dx}$ is (1)

A. $c_1x + c_2 + (c_3x + c_4)\cos(\sqrt{3}x) + (c_5x + c_6)\sin(\sqrt{3}x)$

B. $c_1x + c_2 + (c_3x + c_4)\cos 3x + (c_5x + c_6)\sin 3x$

C. $(c_1x + c_2)\cos 4x + (c_3x + c_4)\sin 4x$

D. $c_1x + c_2 + (c_3x + c_4)e^{[\sqrt{3}x]}$

Solution:

34. The solution of differential equation $\dfrac{d^3y}{dx^3} - 7\dfrac{dy}{dx} - 6y = 0$ (1)

A. $c_1e^x + c_2e^{2x} + c_3e^{3x}$

B. $c_1e^{-x} + c_2e^{-2x} + c_3e^{-3x}$

C. $c_1e^{-x} + c_2e^{2x} + c_3e^{3x}$

D. $c_1e^{-x} + c_2e^{-2x} + c_3e^{3x}$

Solution:

35. The solution of differential equation $\frac{d^3y}{dx^3} + 2\frac{d^2y}{dx^2} + \frac{dy}{dx} = 0$ (1)

A. $c_1 + (c_2x + c_3)e^x$

B. $c_1 + (c_2x + c_3)e^{-x}$

C. $(c_2x + c_3)e^{-x}$

D. $c_1 + c_2e^x + c_3e^{-x}$

Solution:

36. The solution of differential equation $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = 0$ (1)

A. $c_1e^x + c_2e^{2x}$

B. $c_1e^{-x} + c_2e^{-x}$

C. $(c_1x + c_2)e^x$

D. $(c_1x + c_2)e^{-x}$

Solution:

37. The solution of differential equation $\frac{d^2y}{dx^2} + 9y = 0$ (1)

A. $c_1 \cos 3x + c_2 \sin 3x$

B. $c_1e^{-3x} + c_2e^{3x}$

C. $(c_1x + c_2)e^{-3x}$

D. $c_1 \cos 2x + c_2 \sin 2x$

Solution:

38. If $m_1 = \alpha + i\beta$ and $m_2 = \alpha - i\beta$ of auxillary equation of fourth order DE $\phi(D)y = 0$ are repeated twice then it's solution is, (1)

A. $e^{\beta x}[c_1 \cos \alpha x + c_2 \sin \alpha x]$

B. $e^{\alpha x}[(c_1 x + c_2) \cos \beta x + (c_3 x + c_4) \sin \beta x]$

C. $(c_1 x + c_2)e^{\alpha x} + (c_3 x + c_4)e^{\beta x}$

D. $e^{\alpha x}[c_1 \cos \beta x + c_2 \sin \beta x]$

Solution:

2 Short Cut Method for Nonhomogeneous LDE

39. Particular integral of linear differential equation with constant coefficient $\phi(D)y = f(x)$ is given by, (1)

A. $\frac{1}{\phi(D)}f(x)$

B. $\frac{1}{\phi(D)f(x)}$

C. $\phi(D)\frac{1}{f(x)}$

D. $\frac{1}{\phi(D^2)}f(x)$

Solution:

40. $\frac{1}{D+m}f(x)$,where D $\equiv \frac{d}{dx}$ and m is constant, is equal to (1)

A. $e^{-mx}\int e^{mx}dx$

B. $\int e^{mx}f(x)dx$

C. $e^{mx}\int e^{-mx}f(x)dx$

D. $e^{-mx}\int e^{mx}f(x)dx$

Solution:

41. $\frac{1}{D-m}f(x)$,where D $\equiv \frac{d}{dx}$ and m is constant, is equal to (1)

A. $e^{mx}\int e^{-mx}dx$

B. $\int e^{mx}f(x)dx$

C. $e^{mx}\int e^{-mx}f(x)dx$

D. $e^{-mx}\int e^{mx}f(x)dx$

Solution:

42. Particular integral $\frac{1}{\phi(D)}e^{ax}$, where $D \equiv \frac{d}{dx}$ and $\phi(a) \neq 0$ is, (1)

A. $\frac{1}{\phi(-a)}e^{ax}$

B. $x\frac{1}{\phi(a)}e^{ax}$

C. $\frac{1}{\phi(a^2)}e^{ax}$

D. $\frac{1}{\phi(a)}e^{ax}$

Solution:

43. Particular integral $\frac{1}{\phi(D-a)^r}e^{ax}$, where $D \equiv \frac{d}{dx}$ is, (1)

A. $\frac{1}{r!}e^{ax}$

B. $\frac{x^r}{r}e^{ax}$

C. $\frac{x^r}{r!}e^{ax}$

D. $x^r e^{ax}$

Solution:

44. Particular integral $\frac{1}{\phi(D^2)}\sin(ax+b)$, where $D \equiv \frac{d}{dx}$ and $\phi(-a^2) \neq 0$ is, (1)

A. $\frac{1}{\phi(-a^2)}\cos(ax+b)$

B. $\frac{1}{\phi(-a^2)}\sin(ax+b)$

C. $x\frac{1}{\phi(-a^2)}\sin(ax+b)$

D. $\frac{1}{\phi(a^2)}\sin(ax+b)$

Solution:

45. Particular integral $\frac{1}{\phi(D^2)}\sin(ax+b)$, where $D \equiv \frac{d}{dx}$ and $\phi(-a^2) = 0, \phi'(-a^2) \neq 0$ is, (1)

A. $x\frac{1}{\phi'(-a^2)}\cos(ax+b)$

B. $x\frac{1}{\phi'(-a^2)}\sin(ax+b)$

C. $\frac{1}{\phi(-a^2)}\sin(ax+b)$

D. $\frac{1}{\phi'(-a^2)}\sin(ax+b)$

Solution:

46. Particular integral $\frac{1}{\phi(D^2)}\cos(ax+b)$, where, $D \equiv \frac{d}{dx}$ and $\phi(-a^2) \neq 0$ is, (1)

A. $\frac{1}{\phi(-a^2)}\cos(ax+b)$

B. $\frac{1}{\phi(-a^2)}\sin(ax+b)$

C. $x\frac{1}{\phi(-a^2)}\cos(ax+b)$

D. $\frac{1}{\phi(a^2)}\cos(ax+b)$

Solution:

47. Particular integral $\frac{1}{\phi(D^2)}\cos(ax+b)$, where, $D \equiv \frac{d}{dx}$ and $\phi(-a^2) = 0, \phi'(-a^2) \neq 0$ is, (1)

A. $x\frac{1}{\phi'(-a^2)}\cos(ax+b)$

B. $x\frac{1}{\phi'(-a^2)}\sin(ax+b)$

C. $\frac{1}{\phi(-a^2)}\cos(ax+b)$

D. $\frac{1}{\phi'(-a^2)}\cos(ax+b)$

Solution:

48. Particular integral $\frac{1}{\phi(D^2)}\sinh(ax+b)$, where,$D \equiv \frac{d}{dx}$ and $\phi(-a^2) \neq 0$ is, (1)

A. $\frac{1}{\phi(-a^2)}\cosh(ax+b)$

B. $\frac{1}{\phi(-a^2)}\sinh(ax+b)$

C. $x\frac{1}{\phi(-a^2)}\sinh(ax+b)$

D. $\frac{1}{\phi(a^2)}\sinh(ax+b)$

Solution:

49. Particular integral $\frac{1}{\phi(D^2)}\cosh(ax+b)$, where,$D \equiv \frac{d}{dx}$ and $\phi(-a^2) \neq 0$ is, (1)

A. $\frac{1}{\phi(-a^2)}\cosh(ax+b)$

B. $\frac{1}{\phi(-a^2)}\cosh(ax+b)$

C. $x\frac{1}{\phi(-a^2)}\sinh(ax+b)$

D. $\frac{1}{\phi(a^2)}\cosh(ax+b)$

Solution:

50. Particular integral $\frac{1}{\phi(D^2)}e^{ax}V$, where V ia any function of x and D$\equiv \frac{d}{dx}$ is, (1)

A. $e^{ax}\frac{1}{\phi(D-a)}V$

B. $e^{ax}\frac{1}{\phi(a)}V$

C. $e^{ax}\frac{1}{\phi(D+a)}V$

D. $\frac{1}{\phi(D+a)}V$

Solution:

51. Particular integral $\frac{1}{D+1}e^{e^x}$, where $D \equiv \frac{d}{dx}$ is, (1)

A. $e^{-x}e^{e^x}$

B. e^{e^x}

C. $e^{x}e^{e^x}$

D. $e^{-2x}e^{e^x}$

Solution:

52. Particular integral $\frac{1}{D+1}\sin e^x$, where $D \equiv \frac{d}{dx}$ is, (1)

A. $-e^{-x}\sin e^x$

B. $e^{-x}\cos e^x$

C. $e^{x}\cos e^x$

D. $-e^{-x}\cos e^x$

Solution:

53. Particular integral $\frac{1}{D+2}e^{-x}\cos e^x$, where $D \equiv \frac{d}{dx}$ is, (1)

A. $e^{-x}\cos e^x$

B. $e^{-x}\sin e^x$

C. $e^{-2x}\cos e^x$

D. $e^{-2x}\sin e^x$

Solution:

54. Particular integral $\frac{1}{D+2}e^{-2x}\sec^2 x(1+2\tan x)$, where $(use\tan x = t) and (D \equiv \frac{d}{dx})$ is, (1)

A. $e^{-2x}(1+\tan^2 x)$

B. $e^{-2x}(\tan x+\tan^2 x)$

C. $e^{2x}(\tan x+2\tan^2 x)$

D. $e^{-2x}(\tan x+\sec x)$

Solution:

55. Particular integral $\frac{1}{D+1}(\frac{1}{1+e^x})$, where $D \equiv \frac{d}{dx}$ is, (1)

A. $e^x \log(1-e^x)$

B. $\log(1+e^x)$

C. $e^x \log(1+e^x)$

D. $e^{-x} \log(1+e^x)$

Solution:

56. Particular integral of differential equation $\frac{d^2y}{dx^2} - 7\frac{dy}{dx} + 6y = e^{2x}$ is (1)

A. $-\frac{xe^{2x}}{3}$

B. $\frac{e^{2x}}{4}$

C. $-\frac{e^{2x}}{4}$

D. $\frac{e^{2x}}{24}$

Solution:

57. Particular integral $(D^2+4D+3)y = e^{-3x}$, where $D \equiv \frac{d}{dx}$ is, (1)

A. xe^{-3x}

B. $-\frac{1}{2}e^{-3x}$

C. $-\frac{x}{2}e^{-3x}$

D. $-\frac{x}{10}e^{-3x}$

Solution:

58. Particular integral $(D^2-5D+6)y = 3e^{5x}$ is, (1)

A. $\frac{e^{5x}}{2}$

B. $\frac{e^{5x}}{6}$

C. $-\frac{e^{5x}}{14}$

D. $-\frac{e^{2x}}{2}$

Solution:

59. Particular integral of differential equation $(D^3 + D)y = \cos x$ is, (1)

A. $-\frac{x}{2}\sin x$

B. $\frac{x}{4}\cos x$

C. $-\frac{1}{2}\cos x$

D. $-\frac{x}{2}\cos x$

Solution:

60. Particular integral of differential equation $(D^2 + 1)y = \sin x$ is, (1)

A. $-\frac{x}{2}\cos x$

B. $-\frac{x}{4}\cos x$

C. $-\frac{x}{2}\sin x$

D. $-\frac{1}{2}\cos x$

Solution:

61. Particular integral of differential equation $(D^3 + 9D)y = \sin 3x$ is, (1)

A. $-\frac{x}{18}\cos 3x$

B. $-\frac{x}{18}\sin 3x$

C. $-x\sin 3x$

D. $-\frac{1}{18}\sin 3x$

Solution:

62. Particular integral of differential equation $(D^4 + 10D^2 + 9)y = \sin 2x + \cos 4x$ is, (1)

A. $-\frac{1}{23}\sin 2x - \frac{1}{105}\cos 4x$

B. $\frac{1}{15}\sin 2x + \cos 4x$

C. $-\frac{1}{15}\sin 2x + \frac{1}{105}\cos 4x$

D. $-\frac{1}{15}\sin 2x + \frac{1}{87}\cos 4x$

Solution:

63. Particular integral of differential equation $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 5y = 10\sin x$ is, (1)

A. $\frac{8}{3}\sin x$

B. $\sin x - 2\cos x$

C. $4\sin x + 2\cos x$

D. $2\sin x + \cos x$

Solution:

64. Particular integral of differential equation $\frac{d^3y}{dx^3} - 4\frac{dy}{dx} = 2\cosh 2x$ is, (1)

A. $\frac{1}{4}\cosh 2x$

B. $\frac{x}{8}\cosh 2x$

C. $\frac{x}{4}\cosh 2x$

D. $\frac{x}{4}\sinh 2x$

Solution:

65. Particular integral of differential equation $(D^2 + 6D - 9)y = 2\sinh 3x$ is, (1)

A. $\frac{1}{18}\cosh 3x$

B. $\frac{1}{2}\cosh 3x$

C. $\frac{1}{18}\sinh 3x$

D. $-\frac{1}{18}\cosh 3x$

Solution:

66. Particular integral of differential equation $(D^4 + D^2 + 1)y = 53x^2 + 17$ is, (1)

A. $53x^2 + 17$

B. $53x^2 - 89$

C. $53x^2 + 113$

D. $3x^2 - 17$

Solution:

67. Particular integral of differential equation $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = e^{-x}\cos x$ is, (1)

A. $e^x \cos x$

B. $-e^{-x}\sin x$

C. $-e^{-x}\cos x$

D. $(c_1 x + c_2)e^{-x}$

Solution:

68. Particular integral of differential equation $(D^2 - D + 1)y = 3x^2 - 1$ is, (1)

A. $3x^2 + 6x + 5$

B. $x^2 - 6x + 1$

C. $3x^2 + 6x - 1$

D. $x^2 + 18x - 11$

Solution:

69. Particular integral of differential equation $(D^2 + 2D + 1)y = e^{-x}(1 + x^2)$ is, (1)

A. $e^{-x}(\frac{x^2}{2} - \frac{x^4}{12})$

B. $e^{-x}(x + \frac{x^3}{3})$

C. $e^{-x}(\frac{x^2}{2} + \frac{x^4}{12})$

D. $(\frac{x^2}{2} + \frac{x^4}{12})$

Solution:

70. Solution of differential equation $(D^2 + 1)y = x$ is, (1)

A. $c_1 \cos x + c_2 \sin x - x$

B. $c_1 \cos x + c_2 \sin x + x$

C. $c_1 \cos x + c_2 \sin x + 2x$

D. $c_1 \cos x + c_2 \sin x - 2x$

Solution:

71. Particular integral of differential equation $(D^2 - 1)y = x^3$ is, (1)

A. $-x^3 + 6x$

B. $x^2 + 6$

C. $x^3 + 6x$

D. $-x^3 - 6x$

Solution:

72. Particular integral of differential equation $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = xe^x \sin x$ is, (1)

A. $-e^x(x \sin x + 2 \cos x)$

B. $e^x(x\sin x - 2\cos x)$

C. $(x\sin x + 2\cos x)$

D. $-e^x(x\sin x + 2\cos x)$

Solution:

73. Solution of differential equation $\frac{d^2y}{dx^2} + \frac{dy}{dx} + y = e^{2x}$ is, (1)

A. $e^x(c_1\cos\frac{\sqrt{3}}{2}x + c_2\sin\frac{\sqrt{3}}{2}x) - \frac{1}{7}e^{2x}$

B. $e^{\frac{x}{2}}(c_1\cos\frac{\sqrt{3}}{2}x + c_2\sin\frac{\sqrt{3}}{2}x) + \frac{1}{5}e^{2x}$

C. $e^{-\frac{x}{2}}(c_1\cos\frac{1}{2}x + c_2\sin\frac{1}{2}x) + \frac{1}{7}e^{2x}$

D. $e^{-\frac{x}{2}}(c_1\cos\frac{\sqrt{3}}{2}x + c_2\sin\frac{\sqrt{3}}{2}x) + \frac{1}{7}e^{2x}$

Solution:

74. Particular integral $(D^4 + 25)y = x^4 + x^2 + 1$, where $D \equiv \frac{d}{dx}$ is, (1)

A. $x^4 + x^2 - \frac{1}{25}$

B. $x^4 + x^2 + \frac{49}{25}$

C. $\frac{1}{25}(x^4 + x^2 + 24x + 1)$

D. $\frac{1}{25}\left(x^4 + x^2 + \frac{1}{25}\right)$

Solution:

75. Particular integral $(D^2 + 6D + 9)y = e^{-3x}x^{-3}$, where $D \equiv \frac{d}{dx}$ is, (1)

A. $\frac{e^{-3x}}{2x}$

B. $e^{-3x}x$

C. $\frac{e^{-3x}}{12x}$

D. $(c_1x + c_2)e^{-3x}$

Solution:

76. Particular integral $(D^3 + 8)y = x^4 + 2x + 1$, where $D \equiv \dfrac{d}{dx}$ is, (1)

A. $\dfrac{1}{8}(x^4 + 5x + 1)$

B. $\dfrac{1}{8}(x^3 - 3x^2 + 1)$

C. $x^4 - x + 1$

D. $\dfrac{1}{8}(x^4 - x + 1)$

Solution:

77. Particular integral $(D^3 + 3D^2 - 4)y = x^2$, where $D \equiv \dfrac{d}{dx}$ is, (1)

A. $-\dfrac{1}{4}\left(x^2 + \dfrac{3}{2}\right)$

B. $\dfrac{1}{4}\left(x^2 + \dfrac{3}{2}x\right)$

C. $(x^2 + \dfrac{3}{2})$

D. $-\dfrac{1}{4}\left(x^2 - \dfrac{3}{2}\right)$

Solution:

78. Particular integral $(D^4 - m^4)y = \cos mx$, where $D \equiv \dfrac{d}{dx}$ is, (1)

A. $-\dfrac{x}{4m^3}\cos mx$

B. $\dfrac{x}{m^3}\sin mx$

C. $-x\sin mx$

D. $-\dfrac{x}{4m^3}\sin mx$

Solution:

79. Particular integral $(D^3 - 4D)y = 2\cosh 2x$, where $D \equiv \dfrac{d}{dx}$ is, (1)

A. $\dfrac{1}{4}\cosh 2x$

B. $\dfrac{x}{8}\cosh 2x$

C. $\dfrac{x}{4}\cosh 2x$

D. $\dfrac{x}{4}\sinh 2x$

Solution:

80. Particular integral $(D^3 - 4D)y = 2\sinh 2x$, where $D \equiv \dfrac{d}{dx}$ is, (1)

A. $\dfrac{1}{4}\cosh 2x$

B. $\dfrac{x}{8}\cosh 2x$

C. $\dfrac{x}{4}\cosh 2x$

D. $\dfrac{x}{4}\sinh 2x$

Solution:

81. For$(D^2 - 6D + 8)y = 5e^{4x}$ particular integral is, (1)

A. 0

B. $\dfrac{5}{2}e^{4x}$

C. $\dfrac{5}{2}xe^{4x}$

D. $\dfrac{5}{2}$

Solution:

82. For$(D^2 + 9)y = \sin 2x$ particular integral is, (1)

A. $\frac{1}{13}\sin 2x$

B. $\frac{1}{13}\cos 2x$

C. $\frac{1}{5}\sin 2x$

D. $-4\sin 2x$

Solution:

83. For$(D^2+D+1)y=\cos 2x$ particular integral is, (1)

A. $\frac{1}{13}(3\cos 2x-2\sin 2x)$

B. $-\frac{1}{13}(3\cos 2x+2\sin 2x)$

C. $-\frac{1}{13}(3\cos 2x-2\sin 2x)$

D. $\frac{1}{13}(3\cos 2x+2\sin 2x)$

Solution:

84. For$(D^2-2D+1)y=e^x$ particular integral is, (1)

A. $\frac{x^2}{2}e^x$

B. $\frac{x}{2}e^x$

C. $\frac{x}{4}e^{x^2}$

D. $\frac{x^2}{5}e^{2x}$

Solution:

3 Variation of Parameter Method

85. Complementary function of differential equation $a_0\frac{d^2y}{dx^2} + a_1\frac{dy}{dx} + a_2y = f(x)$ is $c_1y_1 + c_2y_2$. Then by method of variation of parameters, particular integral is $u(x,y)y_1 + v(x,y)y_2$ where u is obtained from $\cdots$ (1)

A. $\int \frac{f(x)}{y_1y_2' + y_2y_1'}dx$

B. $\int \frac{y_2f(x)}{y_1y_2' - y_2y_1'}dx$

C. $\int \frac{y_1f(x)}{y_1y_2' - y_2y_1'}dx$

D. $\int \frac{-y_2f(x)}{y_1y_2' - y_2y_1'}dx$

Solution:

86. Complementary function of differential equation $a_0\frac{d^2y}{dx^2} + a_1\frac{dy}{dx} + a_2y = f(x)$ is $c_1y_1 + c_2y_2$. Then by method of variation of parameters, particular integral is $u(x,y)y_1 + v(x,y)y_2$ where v is obtained from $\cdots$ (1)

A. $\int \frac{f(x)}{y_1y_2' + y_2y_1'}dx$

B. $\int \frac{y_2f(x)}{y_1y_2' - y_2y_1'}dx$

C. $\int \frac{y_1f(x)}{y_1y_2' - y_2y_1'}dx$

D. $\int \frac{-y_2f(x)}{y_1y_2' - y_2y_1'}dx$

Solution:

87. In solving differential equation$\frac{d^2y}{dx^2} + y = cosecx$ by method of variation of parameters,complementary function= $c_1\cos x + c_2\sin x$, Particular Integral = $u\cos x + v\sin x$, then u is equal to, (1)

A. $-\log\sin x$

B. x

C. $-x$

D. $\log\sin x$

Solution:

88. In solving differential equation $\frac{d^2y}{dx^2} - y = \frac{2}{1+e^x}$ by method of variation of parameters, complementary function= $c_1e^x + c_2e^{-x}$, Particular Integral = $ue^x + ve^{-x}$, then v is equal to, (1)

A. $e^{-x} - \log(1 + e^{-x})$

B. $-\log(1 + e^x)$

C. $\log(1 + e^x)$

D. $e^{-x} + \log(1 + e^{-x})$

Solution:

89. In solving differential equation $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = e^{e^x}$ by method of variation of parameters,complementary function= $c_1e^{-2x} + c_2e^{-x}$, Particular Integral = $ue^{-2x} + ve^{-x}$, then v is equal to, (1)

A. $-e^{e^x}$

B. $e^{-2x}e^{e^x}$

C. $e^xe^{e^x}$

D. e^{e^x}

Solution:

90. In solving differential equation $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = e^{e^x}$ by method of variation of parameters, complementary function= $c_1e^{-2x} + c_2e^{-x}$, Particular Integral = $ue^{-2x} + ve^{-x}$ then v is equal to, (1)

A. $-e^{e^x}$

B. $e^{-2x}e^{e^x}$

C. $e^xe^{e^x}$

D. e^{e^x}

Solution:

91. In solving differential equation $\frac{d^2y}{dx^2} + 4y = 4\sec^2 2x$ by method of variation of parameters,complementary function= $c_1 \cos 2x + c_2 sin2x$, Particular Integral = $u \cos 2x + v sin2x$ then u is equal to, (1)

A. $\log(\sec 2x + \tan 2x)$

B. $-\sec 2x$

C. $\sec 2x + \tan 2x$

D. $\log(\tan 2x)$

Solution:

92. In solving differential equation $\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 9y = \frac{e^{3x}}{x^2}$ by method of variation of parameters,complementary function= $c_1xe^{3x} + c_2e^{3x}$, Particular Integral = $uxe^{3x} + ve^{3x}$, then u is equal to, (1)

A. $-e^x\cos(e^x) + \sin(e^x)$

B. $-\cos(e^x)$

C. $\cos(e^x)$

D. $e^x\sin(e^x) + \cos(e^x)$

Solution:

93. In solving differential equation $\frac{d^2y}{dx^2} + 4y = sec2x$ by method of variation of parameters,complementary function= $c_1\cos 2x + c_2\sin 2x$, Particular Integral = $u\cos 2x + v\sin 2x$, then u is equal to, (1)

A. $-\frac{1}{2}x$

B. $\frac{1}{4}\log(\cos 2x)$

C. $-\frac{1}{4}\log(\cos 2x)$

D. $\frac{1}{2}x$

Solution:

94. In solving differential equation $\frac{d^2y}{dx^2} + y = \tan x$ by method of variation of parameters,complementary function= $c_1\cos x + c_2\sin x$, Particular Integral = $u\cos x + v\sin x$, then v is equal to, (1)

A. $-\cos x$

B. $[\log(secx + \tan x)] - \sin x$

C. $-[\log(secx + \tan x)] - \sin x$

D. $\cos x$

Solution:

95. In solving differential equation $\frac{d^2y}{dx^2} + 9y = \frac{1}{1+\sin 3x}$ by method of variation of parameters,complementary function= $c_1 \cos 3x + c_2 \sin 3x$, Particular Integral = $u \cos 3x + v \sin 3x$ then v is equal to, (1)

A. $-\frac{1}{3}(-\frac{1}{3}\sec 3x + \frac{1}{3}\tan 3x - x)$

B. $-\frac{1}{9}\log(1 + \sin 3x)$

C. $\frac{1}{9}\log(1 + \sin 3x)$

D. $\frac{1}{3}\log\cos x$

Solution:

4 Simultaneous LDE and Symmetrical LDE

96. Solution of symmetric simultaneous differential equation (1)

$$\frac{dx}{x} = \frac{dy}{y} = \frac{dz}{z}$$

is

A. $x = c_1 y, y = c_2 z$

B. $xy = c_1 z, yz = c_2 x$

C. $x + y = c_1, y + z = c_2$

D. $x + y = c_1, y - z = c_2$

Solution:

97. Using a set of multipliers as $1, 1, 1$ the solution of differential equation (1)

$$\frac{dx}{y-z} = \frac{dy}{z-x} = \frac{dz}{x-y}$$

is

A. $x^2 + y^2 + z^2 = c$

B. $x - y - z = c$

C. $x + y + z = c$

D. $-x + y - z = c$

Solution:

98. Considering the first two ratio of the symmetrical simultaneous DE (1)

$$\frac{dx}{y^2} = \frac{dy}{x^2} = \frac{dz}{x^2y^2z^2},$$

one of the relation in the solution is DE is

A. $x^2 + y^2 + z^2 = c$

B. $x - y - z = c$

C. $x + y + z = c$

D. $-x + y - z = c$

Solution:

99. For the simultaneous Linear DE $\frac{du}{dx} + v = \sin x$, $\frac{dv}{dx} + u = \cos x$, solution of u using (1)
where $D \equiv \frac{d}{dx}$ is obtain from,

A. $(D^2 + 1)v = 0$

B. $(D^2 - 1)u = 0$

C. $(D^2 - 1)v = -2\sin x$

D. $(D^2 + 1)v = \sin x + \cos x$

Solution:

100. For the simultaneous Linear DE $\frac{du}{dx} + v = \sin x$, $\frac{dv}{dx} + u = \cos x$, solution of v using (1)
$D \equiv \frac{d}{dx}$ is obtain from,

A. $(D^2 + 1)v = 0$

B. $(D^2 - 1)u = 0$

C. $(D^2-1)v = -2\sin x$

D. $(D^2+1)v = \sin x + \cos x$

Solution:

101. Solution of symmetric simultaneous differential equation (1)

$$\frac{dx}{1} = \frac{dy}{1} = \frac{dz}{1}$$

is

A. $x + y = 0, y + z = 0$

B. $x - y = c_1, y + z = c_2$

C. $x + y = c_1, y - z = c_2$

D. $x - z = c_1, y - z = c_2$

Solution:

5 Cauchy's and Legendre's LDE

102. To reduce the differential equation (1)

$$(x+2)^2\frac{d^2y}{dx^2} - 4(x+2)\frac{dy}{dx} + 6y = 4x + 7$$

to linear differential equation with constant coefficients, substitution is

A. $x + 2 = e^{-z}$

B. $x = z + 1$

C. $x + 2 = e^z$

D. $x + 2 = \log z$

Solution:

103. The differential equation (1)

$$x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} - y = \frac{x^3}{1+x^3}$$

, on putting $x = e^z$ and using $D = \frac{d}{dz}$ is transformed into....

A. $x + y = 0, y + z = 0$

B. $x - y = c_1, y + z = c_2$

C. $x + y = c_1, y - z = c_2$

D. $x - z = c_1, y - z = c_2$

Solution:

104. Solution of differential equation (1)

$$x\frac{d^2y}{dx^2} + \frac{dy}{dx} = x,$$

is

A. $(c_1x + c_2) - \dfrac{x^2}{4}$

B. $(c_1x^2 + c_2) + \dfrac{x^2}{4}$

C. $c_1 + c_2\dfrac{1}{x} + \dfrac{1}{2x^2}$

D. $(c_1 \log x + c_2) + \dfrac{x^2}{4}$

Solution: