# SS CENTRE FOR MATHS – 7904 389 447

## WORKSHEET 02 - SECOND AND HIGHER ORDER ODE

01. The general solution of the differential equation $\left(D^2+10D+25\right)y=0$ is

A. $e^{5x}\left(A+Bx\right)$ B. $e^{-5x}\left(A+Bx\right)$

C. $e^{5x}\left(A\cos x+B\sin x\right)$ D. $e^{-5x}\left(A\cos 5x+B\sin 5x\right)$

02. The particular integral of the differential equation $\left(D^2-13D+12\right)y=5e^x$ is

A. $5xe^x/11$ B. $-5xe^x/11$

C. $5e^x/11$ D. $-5x^2e^x/11$

03. Independent solutions of the equation $y''+y'-2y=0$ are

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

C. $e^x, -e^{-x}$ D. $e^x, e^{-x}$

04. General solution for $y''-2y'+10y=0$ is

A. $e^x\left(A\cos 3x+B\sin 3x\right)$ B. $A\cos 3x+B\sin 3x$

C. $Ae^x+Be^{3x}$ D. does not exist

05. The particular integral of $y''-5y'+6y=x^2e^{3x}$ is

A. $e^{3x}x^3/3$ B. $e^{3x}\left(x^3-3x^2+6x\right)/3$

C. $e^{3x}\left(x^3+3x^2-6x\right)/3$ D. $e^{3x}\left(x^3+x^2-2x\right)$

06. The characteristic polynomial of an annihilator for the function $x^ke^{ax}$, where $a$ is any non-negative integer is

A. $r-a$ B. $\left(r-a\right)^k$

C. $\left(r-a\right)^{k+1}$ D. $\left(r-a\right)a^k$

07. Solution for $\left(D^2+5D+6\right)y=e^x$

A. $y=Ae^{-2x}+Be^{-3x}+e^x/12$ B. $y=Ae^{2x}+Be^{3x}$

C. $y=Ae^{2x}+Be^{3x}+e^{-x}/12$ D. $y=Ae^{2x}+Be^{3x}-e^x$

08. Solution for $\left(D^2+D+1\right)y=x^2$ is

A. $\left(A\cos\frac{\sqrt{3}}{2}x+B\sin\frac{\sqrt{3}}{2}x\right)-3x$

B. $e^{-x/2}\left(A\cos\frac{\sqrt{3}}{2}x-B\sin x\right)-x^2$

C. $e^{-x/2}\left(A\cos x+B\sin x\right)-x^2+3x$

D. $e^{-x/2}\left(A\cos\frac{\sqrt{3}}{2}x+B\sin\frac{\sqrt{3}}{2}x\right)+x^2-2x$

09. Every solution of the equation $y''+y'-2y=0$ has the form

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

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

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

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

10. If $L(y)=y''+a_1y'+a_2y=0$, then the value of $L\left(e^{rx}\right)$ is

A. $P(r)e^{-rx}$

B. $P(r)e^{rx}$

C. $P(-r)e^{rx}$

D. $P(-r)e^{-rx}$

11. The particular integral of the differential equation $y''+6y'+9y=2e^{-3x}$ is

A. $e^{-3x}/18$

B. $2xe^{-3x}$

C. $x^2e^{-3x}/2$

D. $x^2e^{-3x}$

12. If $\varphi(x)$ is a solution of the equation $y''+a_1y'+a_2y=0$, where $a_1$ and $a_2$ are constants, then the value of 'k' for which the function $\psi(x)=e^{\frac{a_1}{2}x}\varphi(x)$ is a solution of the equation $y''+ky=0$ is equal to:

A. $a_1^2/4$

B. $a_1a_2$

C. $\frac{a_1^2+a_2^2}{4}$

D. $a_2-\frac{a_1^2}{4}$

13. For the equation $y^{(100)}+100y=2e^{5x}$, which one of the following is a solution?

A. $2e^{5x}$

B. $e^{5x}/5^{100}$

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

D. $\frac{2e^{5x}}{5^{100}+100}$

14. The general solution of the equation $y^{(n)}-nC_1y^{(n-1)}+nC_2y^{(n-2)}-\cdots-(-1)^n y=e^x$ is

A. $\left(c_1+c_2x+c_3x^2+\cdots+c_{n-1}x^{n-1}\right)e^x$

B. $\left(c_1+c_2x+c_3x^2+\cdots+c_{n-1}x^{n-1}\right)e^x+\frac{x^{n-1}}{(n-1)!}e^x$

C. $c_1+c_2x+c_3x^2+\cdots+c_nx^{n-1}+\frac{x^n}{n!}e^x$

D. $\left(c_1+c_2x+c_3x^2+\cdots+c_nx^{n-1}\right)e^x+\frac{x^n}{n!}e^x$

15. The linear differential equation with constant coefficient is of the form

A. $\left(x^2+y^2+x\right)dx-\left(2x^2+2y^2-y\right)dy=0$ B. $y''-3y'+2y=\sin 3x$

C. $3x^2y''+xy'+y=x$ D. $x^2y''-3xy'-5y=\sin\left(\log x\right)$

16. The solution of $(D^2+4)y=0$ is

A. $y=A\cos 2x+B\sin 2x$ B. $y=A\cos 2x+Bx$

C. $y=e^{2x}(A\cos 2x+B\sin 2x)$ D. $y=e^{-2x}(A\cos 2x+B\sin 2x)$

17. C.F of $(D^2-8D+16)y=e^{4x}$ is

A. $\frac{x^2e^{4x}}{2}$ B. $(Ax+B)e^{4x}$

C. $Ae^{4x}+Be^{-4x}$ D. $A\cos 4x+B\sin 4x$

18. C.F of $(D^2+a^2)y=\text{sinax}$ is

A. $A\cos ax+B\text{sinax}$ B. $A\cosh ax+B\text{sinhax}$

C. $A\text{cosax}-B\text{sinhax}$ D. $A\cos 4x+B\sin 4x$

19. The C.F. of $(D^2+2D+3)y=0$ is

A. $y=Ae^{-2x}+Be^{2x}$ B. $y=e^x(A\sqrt{2}x+B\sqrt{2}x)$

C. $y=e^{-x}(A\cos\sqrt{2}x+B\sin\sqrt{2}x)$ D. $y=(A\cos\sqrt{2}x+B\sin\sqrt{2}x)$

20. C.F of $(D^2-2D+1)y=x^2+1$ is

A. $e^{2x}(Ax+B)$ B. $(Ax+B)e^x$

C. $(Ax+B)e^{-x}$ D. $(Ax+B)e^{-2x}$

21. C.F of $(D^2-4)y=0$ is

A. $e^{2x}(Ax+B)$ B. $(Ax+B)e^{-2x}$

C. $Ae^{-2x}+Be^{2x}$ D. $A\cos 2x+B\sin 2x$

22. Complete solution of $(D^2+1)y=x$ is

A. $e^x(Ax+B)+x$ B. $(Ax+B)e^{-x}+2x$

C. $A\cos x+B\sin x+x$ D. $A\cos x+B\sin x+2x$

23. The P.I. of $(D^2+5D+7)y=5$ is

A. $2x^2-x$ B. $\frac{5}{7}$

C. $2\frac{x}{7}$ D. $\frac{5e^3}{3}$

24. The P.I of $(D^2-2D+1)y=2e^x$ is

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

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

25. The P.I of $(D^2 - 3D + 2)y = e^{3x}$ is

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

C. $e^{3x}\frac{1}{20}$ D. $Ae^x + Be^{2x}$

26. The P.I of $(D^2 - 3D + 2)y = e^x$ is

A. $xe^x$ B. $e^x/8$

C. $-e^x/8$ D. $-xe^x$

27. The P.I of $(D^2 + 2D + 5)y = xe^x$ is

A. $\frac{e^x}{8}\left(x + \frac{1}{2}\right)$ B. $\left(x - \frac{1}{2}\right)e^x/8$

C. $(x - 1)e^x/8$ D. $\left(-x + \frac{1}{2}\right)e^x/8$

28. The P.I of $(D^2 - 3D + 2)y = e^{-x}$ is

A. $xe^{-x}/6$ B. $e^{-x}/6$

C. $-e^x/3$ D. 6

29. The P.I of $(D^2 - 4)y = e^{-4x} + e^{2x}$ is

A. $\frac{xe^{2x}}{4} + \frac{e^{-4x}}{12}$ B. $e^x + e^{-4x}$

C. $e^x + e^{-4x}$ D. $e^{-5x}/5$

30. The P.I of $(D^2 + 9)y = \cos 3x$ is

A. $\frac{\cos x}{2}$ B. $(\sin 3x)$

C. $\frac{x\sin 3x}{6}$ D. $(x^2 \sin 3x)/6$

31. The P.I of $(D^2 + 9)y = 4\sin 3x$ is

A. $(2x\sin 3x)/3$ B. $-(2x\sin 3x)/3$

C. $(2x\cos 3x)/3$ D. $(-2x\cos 3x)/3$

32. The P.I of $(D^2 + 2)y = 2\cos^2 x$

A. $2\cos^2 x$ B. $\cos^2 x$

C. $2\sin^2 x$ D. $\sin^2 x$

33. The P.I of $(D^2 - 1)y = e^x + \cos 2x$ is

A. $\left(\frac{xe^x}{2}\right) - \frac{\cos 2x}{5}$ B. $\left(\frac{-xe^x}{2}\right) - \frac{\cos 2x}{5}$

C. $\left(\frac{xe^x}{2}\right) + \frac{\cos 2x}{5}$ D. $\left(-\frac{xe^x}{2}\right) + \frac{\cos 2x}{5}$

34. The P.I. of $(D^2 + D + 1)y = x^2$ is

A. $2x^2 - x$ B. $x^2 - 2x$

C. $2x$ D. $x^3/3$

35. The P.I of $(D^2 - 2D + 4)y = e^x \sin x$ is

A. $(e^x \sin x)/2$ B. $(e^x \sin x)/4$

C. $(e^x \cos x)/2$ D. $(e^x \cos x)$

36. The P.I of $(D + 1)^3 y = e^{-x} + x^2$ is

A. $\left(\frac{x^3 e^{-x}}{6}\right) + x^2 + 6x + 12$ B. $\left(\frac{x^3 e^{-x}}{-6}\right) + x^2 + 6x + 12$

C. $\left(\frac{x^3 e^{-x}}{-6}\right) + x^2 - 6x + 12$ D. $\left(\frac{x^3 e^{-x}}{6}\right) + x^2 - 6x + 12$

37. The P.I of $(D^2 - 2D + 2)y = e^x \sin x$ is

A. $(e^x \cos x)/2$ B. $(-xe^x \cos x)/2$

C. $(xe^x \cos x)/2$ D. $(-x\cos x)/2$

38. The general solution to $y''' - y'' + y' - y = 0$ is given by

A. $y = c_1 e^x + c_2 e^{-x} + c_3$ B. $y = c_1 e^{-x} + (c_2 \cos x + c_3 \sin x)$

C. $y = c_1 e^x + (c_2 \cos x + c_3 \sin x)$ D. $y = (c_1 x + c_2)e^{-x} + c_3 e^x$

39. The solution of the differential equation $(D^3 - 12D + 16)y = 0$ is

A. $y(x) = Ae^{-4x} + Be^{2x} + Cxe^{2x}$ B. $y(x) = Ae^{-4x} + (B + Cx)e^{-2x}$

C. $y(x) = (Ax + B)e^{-2x} + Ce^{4x}$ D. None of these

40. The Particular integral of $4y'' - 4y' + 3y = 4$ is

A. 4 B. 0

C. 2 D. 4 / 3

41. The general solution to $y''' + 2y'' - 11y' - 12y = 0$ *is*

A. $y = c_1 e^{-3x} + c_2 e^{-4x} + c_3 e^{-x}$ B. $y = c_1 e^{-3x} + c_2 e^{4x} + c_3 e^x$

C. $y = c_1 e^{3x} + c_2 e^{-4x} + c_3 e^{-x}$ D. $y = c_1 e^{3x} - c_2 e^{-4x} + c_3 e^{-x}$

42. The roots of the auxiliary equation of a differential equation are $1 \pm i, 1 \pm i$. Then the complementary function is given by...

A. $y_c = e^x(c_1 \cos x + c_2 \sin x)$ B. $y_c = e^x[(c_1 x + c_2)\cos x + (c_3 x + c_4)\sin x]$

C. $y_c = e^{-x}[(c_1 x + c_2)\cos x + (c_3 x + c_4)\sin x]$ D. $y_c = c_1 e^{3x} - c_2 e^{-4x} + c_3 e^{-x}$

43. Which is the correct option, if roots of auxiliary equation are $1, -1, -1, 1 \pm 2i$ given by

A. $y = c_1e^x + c_2e^{-x} + c_3e^{-x} + e^x(c_4\cos 2x + c_5\sin 2x)$

B. $y = (c_1x + c_2)e^x + c_3e^{-x} + e^{2x}(c_4\cos x + c_5\sin x)$

C. $y = c_1e^x + (c_2x + c_3)e^{-x} + e^x(c_4\cos 2x + c_5\sin 2x)$

D. $y = c_1e^x + (c_2x + c_3)e^{-x} + e^{-x}(c_4\cos 2x + c_5\sin 2x)$

44. If $y = (Ax + B)e^{2x}$ is the general solution of the differential equation, then its corresponding differential equation is

A. $(D^2 + 4)y = 0$ B. $(D^2 + 4D + 4)y = 0$

C. $(D^2 - 4D + 4)y = 0$ D. None of these

45. The P.I. of $y'' + y' - 12y = e^{6x}$

A. $y_p = \frac{e^{6x}}{20}$ B. $y_p = \frac{e^{6x}}{30}$

C. $y_p = \frac{e^{-6x}}{60}$ D. $y = \frac{e^{6x}}{10}$

46. What is the particular integral of $(D + 1)^2y = x$ is

A. $x + 2$ B. $x - 2$

C. $\frac{1}{2}(x + 2)$ D. $\frac{1}{2}(x - 2)$

47. The P.I. of $(D^2 + 1)y = e^{2x+3}$ is ...

A. $y_p = \frac{e^{2x+3}}{5}$ B. $y_p = \frac{e^{2x+3}}{7}$

C. $y_p = \frac{e^{2x+3}}{9}$ D. $y_p = \frac{e^{2x+3}}{2}$

48. The particular integral of $(D^2 - 4)y = 3^x$ is

A. $\frac{3^x}{(\log 3)^2 - 4}$ B. $\frac{3^x}{(\log 3) - 4}$

C. $\frac{3^x}{(\log 3)^2 + 4}$ D. $-\frac{3^x}{4}$

49. The P.I. of $(D^2 - 5D + 6)y = 2e^{2x}$ is

A. $y_p = xe^{2x}$ B. $y_p = \frac{xe^{2x}}{2}$

C. $y_p = -2xe^{2x}$ D. $y_p = -xe^{2x}$

50. The P.I. of $(D^3 - 1)y = 2e^x$ is

A. $y_p = xe^x$ B. $y_p = \frac{2xe^x}{3}$

C. $y_p = \frac{3xe^x}{4}$ D. $y_p = -xe^{-3x}$

51. The particular integral $(D^2+1)y=-\sin 2x$ is

A. $\frac{\sin 2x}{3}$ B. $\frac{\sin t}{3}$

C. $\frac{\sin 3x}{2}$ D. $\frac{\sin 2t}{3}$

52. The P.I. of $(D^2+6D+5)y=\cosh 2x$ is

A. $y_p=\frac{e^{-2x}}{42}-\frac{e^{2x}}{6}$ B. $y_p=\frac{e^{2x}}{42}+\frac{e^{-2x}}{6}$

C. $y_p=\frac{e^{-2x}}{42}+\frac{e^{+2x}}{6}$ D. $y_p=\frac{e^{2x}}{42}-\frac{e^{-2x}}{6}$

53. The P.I. of $(D^2-2D+5)y=\sinh 3x$ is

A. $y_p=\frac{e^{3x}}{16}-\frac{e^{-3x}}{40}$ B. $y_p=\frac{e^{3x}}{16}+\frac{e^{-3x}}{40}$

C. $y_p=\frac{e^{3x}}{16}+\frac{xe^{-3x}}{40}$ D. $y_p=\frac{xe^{3x}}{16}+\frac{e^{-3x}}{40}$

54. The P.I. of $(D^2-3D+2)y=7\cos x$ is

A. $y_p=\frac{7}{10}(\cos x-3\sin x)$ B. $y_p=\frac{7}{10}(\sin x+3\cos x)$

C. $y_p=\frac{7}{10}(3\cos x+2\sin x)$ D. $y_p=\frac{7}{10}(3\sin x-2\cos x)$

55. The P.I. of $(D^2+4)^2y=\sin 2x$ is

A. $y_p=-\frac{x^2\cos 2x}{32}$ B. $y_p=\frac{x\cos 2x}{32}$

C. $y_p=\frac{x\sin 2x}{32}$ D. $y_p=-\frac{x^2\sin 2x}{32}$

56. The P.I. of $(D^3-1)y=\sin\left(\frac{x}{2}\right)\cos\left(\frac{x}{2}\right)$ is

A. $y_p=\frac{1}{4}[\cos x+\sin x]$ B. $y_p=\frac{1}{2}[\cos x+\sin x]$

C. $y_p=-\frac{1}{4}[\cos x+\sin x]$ D. $y_p=\frac{1}{4}[\cos x-\sin x]$

57. The particular solution of $(D^2+4D+4)y=e^{-2x}\sin x$ is

A. $(A+Bx)e^{2x}$ B. $e^{-2x}\sin x$

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

58. The particular solution of $(D^4-1)y=\cos x$ is

A. $y_p=-\frac{x\cos x}{4}$ B. $y_p=-\frac{x\sin x}{4}$

C. $y_p=\frac{x\cos x}{4}$ D. $y_p=\frac{\sin x}{5}$

59. The P.I of $\frac{e^{2x}\cos 3x}{D^2-4D+13}$ is

A. $y_p = \frac{xe^{2x}\cos 3x}{6}$

B. $y_p = \frac{xe^{2x}\sin 3x}{6}$

C. $y_p = \frac{e^{2x}\sin 3x}{6}$

D. $y_p = -\frac{xe^{2x}\sin 3x}{6}$

60. The $P$.I of $\frac{e^x x^2}{D^2-2D+1}$ is

A. $y_p = e^x \frac{x^4}{6}$

B. $y_p = e^{-x} \frac{x^3}{12}$

C. $y_p = e^x \frac{x^4}{12}$

D. $y_p = e^{-x} \frac{x^4}{24}$

**SOLUTION**

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| 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |
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