Sandip Foundation's Sandip Institute of Technology & Research Centre, Nashik
S .E. Sem. III : Mathematics
UNIT I : L D E : Multiple Choice Questions
Chose the Correct Alternative

1. The most general form of L D E of the n^{th} order is
   (a) M dx + N dy = 0 , (b) f (D) y = X , (c) f (D) X = y , (d) none of these.

2. Complimentary Function (C.F.) of LDE f(D) y = X is given by
   (a) f (D) = 0 , (b) f '(D) = 0 , (c) y = 0 , (d) none of these.

3. Particular Integral (P. I.) of LDE f (D) y = X is given by
   (a) $\dfrac{f(D)}{X}$, (b) $\dfrac{X}{f(D)}$, (c) X f (D) , (d) none of these

4. The general solution (g. s.) of L D E f (D) y = X with constant coefficients is given by
   (a) Sum of complimentary function and particular solution ,
   (b) Product of complimentary solution and particular solution ,
   (c) Quotient of complimentary function and particular solution , (d) none of these.

5. The solution of ordinary differential equation of n^{th} order contains
   (a) less than n arbitrary constants , (b) more than n arbitrary constants ,
   (c) n arbitrary constants , (d) no arbitrary constants.

6. A solution of L D E contains no arbitrary constants is
   (a) general solution , (b) complimentary solution , (c) particular solution , (d) none of these.

7. A solution of L D E contains arbitrary constants is
   (a) general solution , (b) complimentary solution , (c) particular solution , (d) none of these. .

8 The solution of LDE contains as many as arbitrary constants as the order of the LDE , then the solution is said to be
   (a) Complimentary function , (b) Particular solution , (c) Singular solution , (d) none of these.

9. The solution derived from complete primitive by giving particular values to arbitrary constants is
   (a) Complete solution , (b) Singular solution , (c Particular integral , (d) none of these.

10. The roots of the auxiliary equation of LDE $D^2 - 5D + 6 = 0$ where $D = \dfrac{d}{dx}$ are
    (a) real & equal , (b) Real & distinct , (c) imaginary , (d) none of these.

11. The roots of the auxiliary equation $D^2 + 2D + 1 = 0$ where $D = \dfrac{d}{dx}$ are
    (a) real & equal , (b) Real & distinct , (c) imaginary , (d) none of these.

12. The roots of the auxiliary equation $D^2 + D + 1 = 0$ where $D = \dfrac{d}{dx}$ are
    (a) real & equal , (b) Real & distinct , (c) imaginary , (d) none of these.

13. The complimentary function of L D E $(D^3 + 2D^2 + D) y = 0$
    (a) $A + (B + C x) e^{-x}$, (b) $A + (B + C x) e^{x}$, (c) $(A + B x + C x^2) e^{-x}$, (d) $(A + B x + C x^2) e^{x}$

14. The complimentary function of $\frac{d^2y}{dx^2} + y = \tan x$ is

(a) $A \sin x + B \cos x$, (b) $A \cos x + B \sin x$, (c) $A \sin x$, (d) $B \cos x$.

15. The number of arbitrary constants in complete primitive of L D E $\frac{d^5y}{dx^5} + 2\frac{d^4y}{dx^4} = 0$ contains
(a) 1 , (b) 4 , (c) 5 , (d) none of these.

16. The L D E derived from the equation $y = A e^{2x} + B e^{-2x}$ have the order
(a) 1 , (b) 2 , (c 3 (d) none of these.

17. The complimentary function for the solution of L D E $2x^2 y'' + 3xy' - 3y = x^3$ is obtained as

(a) $Ax + Bx^{-3/2}$, (b) $Ax + Bx^{3/2}$, (c) $Ax^2 + Bx$, (d) $Ax^{-3/2} + Bx^{3/2}$

18. The particular integral of L D E is $f(D)y = X$ where $X = e^{ax}$ and $f(a) \neq 0$ is obtained by

putting in $f(D)$ as (a) $D = 0$, (b) $D = a$, (c) $D = a^2$, (d) none of these.

19. The particular integral of $f(D)y = X$ where $X = \sin ax$ or $\cos ax$ and $f(-a^2) \neq 0$ is obtained

by putting (a) $D = 0$, (b) $D = a$, (c) $D^2 = -a^2$, (d) $D^2 = a^2$

20. The particular integral of $f(D)y = X$ where $X = e^{ax} V$ where V is function of x & $f(D) \neq 0$

is obtained by putting in $f(D)$ for D as (a) $D + a$, (b) $D - a$, (c) $D^2 + a^2$, (d) $D^2 - a^2$

21. The particular integral of L D E $y'' + 3y' + 5y = e^{2x}$ is
(a) $\frac{1}{4} e^{2x}$, (b) $\frac{1}{9} e^{2x}$, (c) $\frac{1}{10}$, (d) none of these

22. The particular integral of $(D^2 + 4D + 4)y = e^{-2x}$ is (a) 0, (b) ∞ , (c) $\frac{1}{2} e^{-2x}$, (d) $\frac{x}{2} e^{-2x}$

23. The particular integral of L D E $(D^2 + D + 1)y = \cos 2x$ is
(a) $\frac{1}{13}(2 \sin 2x - 3 \cos 2x)$, (b) $\frac{1}{13}(2 \cos 2x - 3 \sin 3x)$, (c) $\frac{1}{13}(3 \sin 2x - 2 \sin 3x)$, (d) $\frac{1}{13}(3 \cos 2x - 2 \cos 3x)$

24. The particular integral of L D E $(D^2 + 4)y = \cos(2x + 3)$ is
(a) $\frac{x}{4} \cos(2x + 3)$, (b) $\frac{x}{4} \sin(2x + 3)$, (c) $\frac{1}{4} \sin(2x + 3)$, (d) $\frac{1}{4} \cos(2x + 3)$

25. The particular integral of L D E $(D^2 + 4)y = x^2$ is
(a) $\frac{1}{8}(2x^2 - 1)$, (b) $\frac{1}{4}(2x^2 - 1)$, (c) $\frac{1}{2}(2x^2 - 1)$, (d) none of these

26. The particular integral of L D E $(D^2 - 4D + 3)y = e^{2x}$ is
(a) $\frac{e^{2x}}{10} \sin 3x$, (b) $-\frac{e^{2x}}{10} \cos 3x$, (c) $-\frac{e^{2x}}{10} \sin 3x$, (d) $\frac{e^{2x}}{10} \cos 3x$

27. The particular integral of $(D^2 + 4)y = x \sin x$ is (a) $\frac{1}{9}(3x \cos x - 2 \sin x)$
(b) $\frac{1}{9}(2x \cos x - 3 \cos x)$, (c) $\frac{1}{9}(2x \cos x - 3 \sin x)$, (d) $\frac{1}{9}(3x \sin x - 2 \cos x)$

28. The particular integral of L D E $(D^2 + 1)y = \cos x$ is
(a) $\frac{1}{2} \cos x$, (b) $\frac{1}{2} \sin x$, (c) $\frac{1}{2} x \cos x$, (d) $\frac{1}{2} x \sin x$

29. $\left(\frac{1}{D+3}\right)\sin 3x$ = ----- (a) $\frac{1}{13}(2\cos 3x - 3\sin 3x)$,
(b) $\frac{1}{13}(2\sin 3x - 3\cos 3x)$, (c) $\frac{1}{13}(2\sin 3x - 2\cos 3x)$, (d) $\frac{1}{13}(3\sin 3x - 2\cos 3x)$

30. The particular integral of $(D^2 - 4)y = 2\sin\frac{x}{2}$ is
(a) $\frac{8}{17}\cos\frac{x}{2}$, (b) $-\frac{8}{17}\sin\frac{x}{2}$, (c) $\frac{8}{17}e^{2x}$, (d) $Ae^{2x} + Be^{-2x}$

31. The particular integral of L D E $\frac{d^4y}{dx^4} - y = e^x\cos x$ is
(a) $-\frac{1}{5}e^x\cos x$, (b) $\frac{1}{5}e^x\sin x$, (c) $A\cos 4x + B\sin 4x$, (d) none of these

32. The particular integral of L D E $y'' + a^2y = \cos ax$ is
(a) $\frac{x}{2a}\cos ax$, (b) $\frac{x}{2}\sin ax$, (c) $\frac{x}{2a}(\sin ax + \cos ax)$, (d) none of these

33. The particular integral of L D E $y'' - (a+b)y' + aby = e^{ax} + e^{bx}$ is
(a) $\frac{x}{a+b}(e^{ax} + e^{bx})$, (b $\frac{1}{a+b}(e^{-ax} + e^{-bx})$, (c) $\frac{1}{a-b}(e^{ax} + e^{bx})$, (d) $\frac{x}{a-b}(e^{ax} - e^{bx})$

34. The particular integral of L D E $\frac{d^4y}{dx^4} - y = \cosh x\cos x$ is
(a) $-\frac{1}{5}\sinh x\sin x$, (b) $-\frac{1}{5}\cosh x\cos x$, (c) $\frac{1}{5}\sinh x$, (d) $\frac{1}{5}\cosh x$

35. The differential equation $\frac{d^2y}{dx^2} + 6\frac{dy}{dx} + 9y = 50e^{2x}$ have the particular integral as
(a) e^{2x} , (b) $2e^{2x}$, (c) $\frac{2}{3}e^{2x}$, (d) none of these

36. The complimentary function of L D E $(D^4 - 4)y = \sin\frac{x}{2}$ is
(a) $Ae^{2x} + Be^{-2x}$, (b) $Ae^{x} + Be^{-x}$, (c) $(A + Bx)e^{2x}$, (d) none of these

37. The complimentary function of L D E $\frac{d^2x}{dt^2} + 2k\frac{dx}{dt} + n^2x = 0$, k p n & $w = \sqrt{n^2 - k^2}$ is
(a) $e^{-kt}(A\cos wt + B\sin wt)$, (b) $e^{kt}(A\cos wt + B\sin wt)$, (a) $e^{-kt}A\cos wt$, (d) $e^{-kt}\sin wt$

38. In solving d. e. $\frac{d^2y}{dx^2} + y = \tan x$ by method of variation of parameters
C.F. = $c_1\cos x + c_2\sin x$, P. I. == $u\cos x + v\sin x$ then v is equal to
(a) $-\cos x$, (b) $\cos x$, (c) $\log(\sec x + \tan x) - \sin x$, (d) $-[\log(\sec x + \tan x)] + \sin x$

39. In solvig the d. e $\frac{d^2y}{dx^2} + y = \operatorname{cosec} x$ by method of variation of parameters
C.F. = $c_1\cos x + c_2\sin x$, P. I. == $u\cos x + v\sin x$ then u is equal to
(a) - log sinx , (b) x , (c) - x , (d) log sinx .

40. I solving the d. e. $\frac{d^2y}{dx^2} + 4y = 4\sec^2 x$ by method of variation of parameters
C. F. = $c_1\cos 2x + c_2\sin 2x$, P. I. = $u\cos 2x + v\sin 2x$ then v is equal to
(a) $\log(\sec 2x + \tan 2x)$, (b) $\sec 2x$, (c) $\sec 2x + \tan 2x$) , (d) $\log\tan 2x$

41. In solving d . e. $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = \sin e^x$ by the method of variation of parameters ,

C. F. $= c_1 e^{-x} + c_2 e^{-2x}$, P . I . $= u\, e^{-x} + v\, e^{-2x}$ then u is equal to

(a) $-e^x \cos e^x + \sin e^x$, (b) $-\cos e^x$, (c) $\cos e^x$, (d) $e^x \sin e^x + \cos e^x$

42. In solving d . e. $\frac{d^2y}{dx^2} + 9y = \frac{1}{1 + \sin 3x}$ by the method of variation of parameters

C. F. $= c_1 \cos 3x + c_2 \sin 3x$, P. I. $= u \cos 3x + v \sin 3x$ then v is equal to

(a) $\frac{1}{3}\left(-\frac{1}{3}\sec 3x + \frac{1}{\tan 3x} - x\right)$, (b) $-\frac{1}{9}\log(1 + \sin 3x)$

(c) $\frac{1}{9}\log(1 + \sin 3x)$, (d) $\frac{1}{3}\log(\cos x)$

43. For the simultaneous d. e. $\frac{du}{dx} + v = \sin x$, $\frac{dv}{dx} + u = \cos x$, solution of u where $D = \frac{d}{dx}$ is given by

(a) $(D^2 + 1)u = 2\cos u$, (b) $(D^2 - 1)u = 0$,(c) $(D^2 - 1)u = \sin x - \cos x$, (d) $(D^2 - 1)u = -2\sin x$

44. For the simultaneous d. e. given in ex. 43 ,the solution of v is given by

(a) $(D^2 + 1)v = 0$, (b) $(D^2 - 1)u = 0$,(c) $(D^2 - 1)v = -2\sin x.$, (d) $(D^2 + 1)v = \sin x + \cos x$

45. For simultaneous d. e. $\frac{dx}{dt} + y = e^t$, $\frac{dy}{dt} + x = e^t$,the solution of x is obtained from

(a) $(D^2 - 1)x = 2e^t$, (b) $(D^2 - 1)y = -e^t - e^{-t}$,(c) $(D^2 + 1)x = e^{-t} + e^t$, (d) $(D^2 - 1)x = e^t - e^{-t}$

46. C. F. of the d . e . $x^2\frac{d^2y}{dx^2} - 4x\frac{dy}{dx} + 6y = x^5$ is given by

(a) $c_1 x^2 + c_2 x^3$, (b) $c_1 x^2 + c_2 x$, (c) $c_1 x^{-2} + c_2 x^{-3}$, (d) $c_1 x^5 + c_2 x$.

47.C. F. of the d. e. $r^2\frac{d^2u}{dr^2} + r\frac{du}{dr} - u = -k r^5$ is given by

(a) $(c_1 \log r + c_2)r$, (b) $c_1 r + \frac{c_2}{r}$, (c) $c_1 \cos(\log r) + c_2 \sin(\log r)$, (d) $c_1 r^2 + \frac{c_2}{r^2}$.

48. P. I. 0f d. e. $(D^2 + 1)(D - 1)y = e^x$ is given by

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

49. Solution of symmetric simultaneous d. e. $\frac{dx}{x} = \frac{dy}{y} = \frac{dz}{z}$ is given by (a) $x = c_1 y$, $y = c_2 z$,

(b) $xy = c_1 z$, $yz = c_2 z$, (c) $x + y = c_1 z$, $y + z = c_2$, (d) $x + y = c_1$, $y - z = c_2$.

50. Using a set of multipliers x^3 , y^3 , z^3 the solution of the symmetric simultaneous equation

$\frac{dx}{z(xy^4 - z^4)} = \frac{dy}{y(z^4 - 2x^4)} = \frac{dz}{z(x^4 - y^4)}$ is given by

(a) $x + y + z = c$, (b) $xyz = c$, (c) $x^3 + y^3 + z^3 = c$, (d) $x^4 + y^4 + z^4 = c$

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