

### MCQs ( Units -II, III)

- The general solution of the differential equation  $y'' - 4y = 0$  is
  - $a \cos 2x + b \sin 2x$
  - $ae^{-2x} + bxe^{2x}$
  - $ae^{-2x} + bx^2e^{2x}$
  - $ae^{-2x} + be^{2x}$
- What is the Wronskian of  $x, x^2, x^3$  ?
  - $2x^3$
  - $x^3$
  - $3x^3$
  - $4x^3$
- If differential equation  $y' = \frac{3y}{x}$  is normal over the interval I then I is
  - $(-\infty, 2)$
  - $(-\infty, \infty)$
  - $(-2, \infty)$
  - $(-\infty, 0) \cup (0, \infty)$
- If  $y'' + y = 32x^3$  then by the method of undetermined coefficient the assumed particular integral
  - $y_p(x) = c_1x^3 + c_2x^2 + c_3$
  - $y_p(x) = c_1x^3 + c_2x^2 + c_3x + c_4$
  - $y_p(x) = c_1x^3 + c_2$
  - $y_p(x) = c_1x^2 + c_2x + c_3$
- Particular integral for the differential equation  $(D^2 + 9)y = \sin 3x$  is
  - $\frac{x \cos 3x}{6}$
  - $-\frac{x \cos 3x}{6}$
  - $\frac{x \cos 3x}{3}$
  - $\frac{x \cos 2x}{6}$
- The particular integral of the differential equation  $y'' + y = \tan x$  if  $y_1 = \cos x, y_2 = \sin x$  is
  - $y_p(x) = \sin x - \ln|\sec x + \tan x|$
  - $y_p(x) = \cos x - \ln|\sec x + \tan x|$
  - $y_p(x) = -\cos x \ln|\sec x + \tan x|$
  - $y_p(x) = -\ln|\sec x + \tan x|$
- The general solution of the differential equation  $x^2y'' + xy' - 4y = 0$  is
  - $ax^2 + \frac{b}{x^2}$
  - $ax + \frac{b}{x^2}$
  - $ax^2 + \frac{b}{x}$
  - $3x + 4/x^2$
- For the system of the differential equations  $(2D - 4)y_1 + (3D + 5)y_2 = 3t + 2, (D - 2)y_1 + (D + 1)y_2 = t$ , the value of  $y_2$  is given by
  - $ae^{3t} + \frac{1}{9}(3t + 5)$
  - $ae^{3t} - \frac{1}{9}(3t + 5)$
  - $ae^{-3t} - \frac{1}{9}(3t + 5)$
  - $ae^{-3t} + \frac{1}{9}(3t + 5)$

9 If  $e^{kx}$  is solution of  $4y'' + 7y' + 3y = 0$  then  $k$  is

- a) 1                                      b) 2                                      c)  $\frac{3}{4}$                                       d)  $-\frac{3}{4}$

10. what is lowest order of differential equation whose particular integral is  $3 \cos 2x + 5 \sinh 3x$

- a) 2                                      b) 3                                      c) 4                                      d) 6

11. If  $ay'' + by' + cy = 0$  be second order differential equation where  $a, b, c$  are functions of  $x$  and  $a \neq 0$  on any interval then wronskian according to Abel's formula is

- a)  $w(x) = \text{constant}$                       b)  $w(x) = Ae^{\int \frac{-b}{a} dx}$                       c)  $w(x) = Ae^{\int \frac{b}{a} dx}$                       d) None.

12. If  $ay'' - by' + cy = 0$  be second order differential equation then its roots are real and distinct if

- a)  $b^2 - 4ac \geq 0$                       b)  $b^2 - 4ac = 0$                       c)  $b^2 - 4ac \leq 0$                       d) both a and b

13.  $e^{-i3x}, e^{i3x}$  be solution of

- a)  $y'' + 6y' + 9y = 0$                       b)  $y'' - 6y' + y = 0$                       c)  $y'' + 9y = 0$                       d)  $y'' - 9y = 0$

14. If  $(D - a)y = X$  then  $y_p = \frac{1}{D-a}X =$

- a)  $e^{ax} \int X e^{-ax} dx$                       b)  $e^{-ax} \int X e^{-ax} dx$                       c)  $e^{-ax} \int X e^{ax} dx$                       d)  $e^{ax} \int X e^{ax} dx$

15. Which of the following is true?

- a)  $\frac{1}{f(D)} \cos bx e^{ax} = e^{ax} \frac{1}{f(D+b)} \cos bx$                       b)  $\frac{1}{f(D^2)} \cos bx e^{ax} = \cos bx \frac{1}{f(-a^2)} e^{ax}$   
c)  $\frac{1}{f(D)} x e^{ax} = x \frac{1}{f(D+a)} e^{ax}$                       d)  $\frac{1}{f(D)} x^2 e^{ax} = e^{ax} \frac{1}{f(D+a)} x^2$

16. If  $y_1(t), y_2(t)$  satisfy the equations  $y_1' + 5y_2 = 0$ ,  $y_2' + y_1 = 0$  and  $y_2'' + by_2 = 0$  is the second order differential equation satisfied by  $y_1$  then what is the value of  $b$

- a) 5                                      b) -5                                      c) 3  
d) -3

17. For a given system of linear differential equation  $y_1' = 2y_1 + y_2$ ,  $y_2' = y_1 + 2y_2$ , the second order linear differential satisfied by the  $y_1$  is

- a)  $y_1'' + 4y_1' + 3y_1 = 0$                       b)  $y_1'' - 4y_1' + 3y_1 = 0$                       c)  $y_1'' - 4y_1' - 3y_1 = 0$   
(d) none

18. What are the characteristic roots of a homogeneous LDE having  $4 + x e^{2x}$  as its particular solution?

- a) 0, 2                                      b) 4, 2                                      c) 4, 2, 2                                      d) 0, 2, 2

19. The general solution of  $y^{(4)} - 2y''' = 0$  is given by

- a)  $A + B e^{2x} + D x e^{2x}$       b)  $A + B + C e^{2x}$       c)  $A + B x + C x^2 + D e^{2x}$       d)  $A + B x + C x^2$

where A, B, C and D are arbitrary constants.

20. The DE  $x^2 y'' - 4xy' + 6y = 0$  on  $(0, \infty)$  has \_\_\_\_ linearly independent solutions.  
a) 2      b) 3      c) infinite      d) Can't say

21. The general solution of the equation  $4y'' - 4y' + y = 8e^{x/2}$  is given by  
a)  $Ae^{x/2} + Be^{x/2} + x^2 e^{x/2}$   
b)  $Ae^{x/2} + Bxe^{x/2} + x^2 e^{x/2}$   
c)  $Ae^{x/2} + Be^{x/2} + e^{x/2}$   
d)  $Ae^{x/2} + Bxe^{x/2} + xe^{x/2}$

22. If  $(D^2 - 3D + 2)y = \cosh x$ , then what will be the Complementary Factor?

- a)  $C_1 e^{-x} + C_1 e^{-2x}$       b)  $C_1 e^x + C_1 e^{2x}$       c)  $C_1 e^{-\frac{x}{3}} + C_1 e^{-\frac{2x}{3}}$       d)  $\frac{e^{2x}}{5} + \frac{e^{\frac{4x}{7}}}{7}$

23. If  $\frac{d^2 y}{dx^2} + P \frac{dy}{dx} + Qy = e^{ax} V$ ,  $V$  is a function of  $x$ , then Particular Integral will be written as

- a)  $\frac{1}{f(D+a)} V$       b)  $e^{ax} \frac{1}{f(D+a)} V$       c)  $e^{ax} \frac{1}{f(D-a)} V$       d)  $e^{ax} \frac{1}{f(D^2 + a^2)} V$

24. The auxiliary equation of  $4x^2 y'' + y = 0$  is

- a)  $4m^2 + 4m + 1 = 0$   
b)  $4m^2 + 1 = 0$   
c)  $4m^2 - 4m + 1 = 0$   
d)  $4m^2 - 4m - 1 = 0$

25. The auxiliary equation of the second order Euler Cauchy differential equation  $x^2 y'' - 5xy' + 13y = 30x^2$  has roots

- a) -3, 2  
b) 3, 2  
c)  $-3 \pm 2i$   
d)  $3 \pm 2i$

26. The characteristic equation of  $4x^2 y'' + y = 0$  has double root  $\frac{1}{2}$ , what is its general solution?

- a)  $(A + B \ln x) x^{1/2}$   
b)  $(A + Bx) e^{x/2}$   
c)  $Ax^{1/2}$   
d)  $Ae^{x/2}$

27. If  $m-1$  and  $m+2$  are factors of auxiliary equation of  $y'' + y' - 2y = 0$  then general solution is

- (a)  $Ae^{-x} + Be^{2x}$       (b)  $e^x + e^{-2x}$       (c)  $Ae^x + Be^{-2x}$       (d)  $e^{-x} + e^{2x}$

28. The Wronskian of the functions  $f(x) = \sec x$  and  $g(x) = \tan x$  is

- (a) 1      (b) -1      (c)  $\sec x$       (d)  $\tan x$

29. If  $e^{-x}$  and  $e^{2x}$  are solutions of  $y'' - y' - 6y = 0$  then roots of auxiliary equation are  
 (a) 1 and -2 (b) -1 and 2 (c) 1 and 2 (d) -1 and -2
30. The general solution of  $4y'' - 9y' + 2y = 0$  is  
 (a)  $Ae^{2x}$  (b)  $Ae^{2x} + Be^{\frac{x}{4}}$  (c)  $(A + Bx)e^{2x}$  (d)  $(A + B)e^{2x}$
31. The general solution of  $4y'' - 4y' + 17y = 0$  is  
 (a)  $Ae^{\frac{x}{2}} + Be^{\pm 2x}$  (b)  $Ae^{2x} + Be^{-2x}$   
 (c)  $e^{2x} \left( A \cos \frac{x}{2} + B \sin \frac{x}{2} \right)$  (d)  $e^{\frac{x}{2}} (A \cos 2x + B \sin 2x)$
32. The general solution of  $y''' + 4y'' + 5y' + 2y = 0$  is  
 (a)  $Ae^{-2x} + (B + Cx)e^{-x}$  (b)  $Ae^{-x} + (B + Cx)e^{-2x}$   
 (c)  $Ae^{-2x} + (B + C)xe^{-x}$  (d)  $(A + Bx)e^{-x} + (C + Dx)e^{2x}$
33. If D is a differential operator then value of  $\frac{1}{D}(e^{-2x} + \sin 2x + 4)$   
 (a)  $-\frac{e^{-2x}}{2} - \frac{\cos 2x}{2}$  (b)  $-\frac{e^{-2x}}{2} + \frac{\cos 2x}{2} + 4x$  (c)  $-\frac{e^{-2x}}{2} - \frac{\cos 2x}{2} + 4x$   
 (d)  $-\frac{e^{-2x}}{2} - \frac{\cos 2x}{2} + 4$
34. Particular Integral of  $y'' + 2y' - 3y = e^{2x}$  is  
 (a)  $-\frac{1}{5}e^{2x}$  (b)  $\frac{1}{5}e^{2x}$  (c)  $\frac{1}{5}$  (d)  $-\frac{1}{5}$
35. Particular Integral of  $y'' + 4y = \sin 2x$  is  
 (a)  $-\frac{1}{2}\cos 2x$  (b)  $\frac{x}{2}\cos 2x$  (c)  $-\frac{x}{2}\cos 2x$  (d)  $-x\cos 2x$
36. If D is a linear differential operator then  $\frac{1}{f(D)}.e^{-\alpha x} =$   
 (a)  $\frac{1}{f(-\alpha^2)}.e^{-\alpha x}$ ,  $f(-\alpha^2) \neq 0$  (b)  $\frac{1}{f(D - \alpha)}.e^{-\alpha x}$   
 (c)  $\frac{1}{f(\alpha^2)}.e^{-\alpha x}$ ,  $f(\alpha^2) \neq 0$  (d)  $\frac{1}{f(-\alpha)}.e^{-\alpha x}$ ,  $f(-\alpha) \neq 0$
37. In method of undetermined coefficients if complimentary function  $y_c = Ae^{-x} + (B + Cx)e^{2x}$  of equation  $y''' - 3y'' + 4y = e^{2x}$  then choice of particular integral will be  
 (a)  $cxe^{2x}$  (b)  $cx^2e^{2x}$  (c)  $ce^{2x}$  (d)  $c_1e^{-x} + C_2e^{2x}$
38. In method of undetermined coefficients. If complementary function  $y_c = A\cos 2x + B\sin 2x$  of equation  $y'' + 4y = \sin 2x$  then choice of particular integral  
 (a)  $c_1 x \cos 2x + c_2 \sin 2x$  (b)  $c_1 \cos 2x + c_2 x \sin 2x$

- (c)  $x[c_1 \cos 2x + c_2 \sin 2x]$  (d)  $c_1 \cos 2x + c_2 \sin 2x$
39. General solution of  $x^2 y'' + xy' - 4y = 0$   
 (a)  $y = Ax + Bx^{-2}$  (b)  $y = Ax^2 + Bx^{-2}$  (c)  $y = Ax^2 + Bx$  (d)  $y = Ax^{-2} + Bx^{-2}$
40. General solution of  $x^2 y'' + 3xy' + 10y = 0$   
 (a)  $y = x[ACos(3\log x) + BSin(3\log x)]$  (b)  $y = x[ACos(\log x) + BSin(\log x)]$   
 (c)  $y = x^{-1}[ACos(\log x) + BSin(\log x)]$  (d)  $y = x^{-1}[ACos(3\log x) + BSin(3\log x)]$
41. General solution of system of simultaneous equations  $y_1' = -2y_1 + y_2$   
 $y_2' = y_1 - 2y_2$   
 (a)  $y_1 = Ae^{-t} + Be^{3t}, y_2 = Ae^t - Be^{3t}$  (b)  $y_1 = Ae^{-t} + Be^{3t}, y_2 = Ae^t - Be^{3t}$   
 (c)  $y_1 = Ae^{-t} + Be^{-3t}, y_2 = Ae^t + Be^{-3t}$  (d)  $y_1 = Ae^{-t} + Be^{-3t}, y_2 = Ae^t - Be^{-3t}$
42. The roots of auxiliary equation of  $x^2 y'' + xy' - 9y = 0$  are  
 a) 3, 3 b) -3, -3 c) -3, 3 d) None of these
43. The equation  $y'' + xy' + 6y = \ln(x^2 - 9)$  is normal in any of the subintervals of  
 a)  $(3, \infty)$  b)  $(0, \infty)$  c)  $(0, 4)$  d)  $(-\infty, -3) \cup (3, \infty)$
44.  $A2x + B(6x+3) + C(3x+2) = 0$  will be linearly independent when  
 a)  $A=B=C$  b)  $A=B=C=0$  c)  $\text{Wronskian}(A, B, C) = 0$  d)  $A=B=C=1$
45. General solution of  $y'' - y' - 2y = 0$  is  
 a)  $Ae^{2x} + Be^x$  b)  $Ae^{2x} + Be^{-x}$  c)  $Ae^{-2x} + Be^x$  d)  $Ae^{-2x} + Be^x$
46. General solution of  $4y'' + 8y' - 5y = 0$  is given by  
 a)  $Ae^{x/2} + Be^{-5x/2}$  b)  $Ae^{-x/2} + Be^{-5x/2}$  c)  $Ae^{x/2} + Be^{5x/2}$  d)  $Ae^{-x/2} + Be^{5x/2}$
47. Particular integral for  $y'' + 16y = \cos 4x$  is  
 a)  $-2x \sin 4x$  b)  $-\frac{x \sin 4x}{8}$  c)  $\frac{x \sin 4x}{8}$  d) None of these
48. The diff. equation of  $(D^2 + 6D + 9)y = 50e^{2x}$  has P.I.  
 a)  $\frac{2}{3}e^{2x}$  b)  $2e^{2x}$  c)  $e^{2x}$  d) None of these
49. By method of undetermined coefficient, the choice of particular integral for  $y'' - 4y = 5e^{-2x}$  is  
 a)  $Ce^{-2x}$  b)  $Cxe^{-2x}$  c)  $Cx^2e^{-2x}$  d)  $Cx^3e^{-2x}$
50. By variation of parameters  $y'' + 4y = \cos 2x$ , the value of wronskian is  
 a) 1 b) 2 c) 4 d) none of these

51. General solution of  $y'' + 16y = 12e^{-2x}$  is

- a)  $Ae^{-4x} + Be^{4x} + \frac{3}{5}e^{-2x}$  b)  $A\cos 4x + B\sin 4x + \frac{3}{5}e^{-2x}$  c)  $Ae^{4x} + Bxe^{4x} + e^{-2x}$  d) none of these

52. The solution of diff. equation  $x^2 y'' + xy' + y = 0$  is

- a)  $c_1 \cos(\ln x) + c_2 \sin(\ln x)$  b)  $c_1 x + c_2 x^2$  c)  $c_1 \cos x + c_2 \sin x$  d) None of these

53. By elimination, solution of  $y_2$  in the simultaneous system  $(D + 3)y_1 + (3D + 23)y_2 = e^{-2t}$  and  $(D + 2)y_1 + (4D + 14)y_2 = e^{2t}$  will be

- a)  $Be^{-t} + Ae^{4t} - e^{2t}$  b)  $Be^{-t} + Ae^{4t} - \frac{5}{6}e^{2t}$  c) 0 d) Does not exist

54.  $x^2 y'' + xy' - 4y = 0$  has auxiliary equation

- a)  $m^2 + 2m - 4 = 0$  b)  $m^2 - 4 = 0$  c)  $m^2 - 2m - 4 = 0$  d)  $m^2 + 4 = 0$