SRM UNIVERSITY

MA1001- CALCULUS AND SOLID GEOMETRY

Unit-III Ordinary Differential Equations

Multiple Choice Questions

1. Which of the following is the general solution to $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} - 10y = 0$

   (a) $y = Ae^{2x} + Be^{-5x}$ (b) $y = Ae^{-2x} + Be^{5x}$ (c) $y = Ae^{-2x} + Be^{-5x}$ (d) $y = Ae^{2x} + Be^{5x}$

2. Solution of $(D^2 + 4)y = 0$ is

   (a) $y = A\cos 2x + B\sin 2x$ (b) $y = Ae^{2x} + Be^{-2x}$ (c) $y = A\cos\sqrt{2}x + B\sin\sqrt{2}x$
   (d) $y = (Ax + B)e^{2x}$

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

   (a) $\frac{-x}{4}\cos 2x$ (b) $\frac{x}{4}\cos 2x$ (c) $\frac{x}{2}\cos 2x$ (d) $\frac{-x}{2}\cos 2x$

4. The equation $(a_0x^2D^2 + a_1xD + a_2)\,y = Q(x)$ is called, where $a_0, a_1, a_2 \in C$

   (a) Cauchy's equation (b) Legendre's equation (c) Taylor's equation (d) Clairaut's equation

5. Use the transformation $z = \log x$, convert the D.E $x^2y'' - xy' + y = x^2$ to an equation with constant coefficients

   (a) $(\theta^2 - 2\theta + 1)y = e^{2z}$ (b) $(\theta^2 - 2\theta + 1)y = e^z$ (c) $(\theta^2 + 2\theta + 1)y = e^{2z}$
   (d) $(\theta^2 + 2\theta + 1)y = e^z$

6. The solution of $(D^2 + 2D + 1)y = 7$ is

   (a) $y = (Ax + B)e^{-x} + 7$ (b) $y = (Ax + B)e^{-x} - 7$ (c) $y = (Ax + B)e^x + 7$
   (d) $y = (Ax + B)e^x - 7$

7. The P.I of $(D - 1)^2y = e^x\sin x$ is

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

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

   (a) $2 - x$ (b) $x + 2$ (c) x^2 (d) $-x^2$

9. If $1 \pm 2i$ are the roots of A.E of a differential equation $f(D)y = 0$ then the general solution is

   (a) $e^{-2x}(A\cos x - B\sin x)$ (b) $Ae^x + Be^{-2x}$ (c) $e^x(A\cos 2x + B\sin 2x)$ (d) $Ae^t + Be^{2x}$

10. Convert the equation $(5 + 2x)^2y'' - 6(5 + 2x)y' + 8y = 0$ to an equation with constant coefficient by using the transformation $z = \log(5 + 2x)$

    (a) $(\theta^2+4\theta+2)y = 0$ (b) $(\theta^2-4\theta+2)y = 0$ (c) $(\theta^2+4\theta+4)y = 0$ (d) $(\theta^2+4\theta-2)y = 0$

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

    (a) $y_p = \frac{\sinh 2x}{8}$ (b) $y_p = \frac{\sinh 2x}{4}$ (c) $y_p = \frac{-\sinh 2x}{8}$ (d) $y_p = \frac{-\sinh 2x}{4}$

12. The P.I of $(D^2+6D+5)y = e^{-x}$ is
    (a) $y_p = \frac{xe^{-x}}{4}$ (b) $y_p = \frac{xe^{-x}}{2}$ (c) $y_p = \frac{e^{-x}}{2}$ (d) $y_p = \frac{e^{-x}}{4}$

13. The solution of $(D^2-2aD+a^2)y = 0$ is
    (a) $Ae^{ax}+Be^{bx}$ (b) $Ae^{ax}+Be^{-ax}$ (c) $(Ax+B)e^{ax}$ (d) $(Ax+B)e^{-ax}$

14. The P.I of $(D^2+16)y = \cos 4x$ is
    (a) $\frac{x}{2}\sin 2x$ (b) $\frac{x\sin 4x}{8}$ (c) $\frac{x}{2}\cos 2x$ (d) $\frac{x\cos 4x}{8}$

15. The C.F of $D^2y + y = cosecx$ is
    (a) $Ae^{ax}+Be^{bx}$ (b) $A\cos x + B\sin x$ (c) $(Ax+B)e^{ax}$ (d) $(Ax+B)e^{-ax}$

16. If $y_1 = \cos ax, y_2 = \sin ax$ then the value of $y_1y_2' - y_2y_1'$ is
    (a) -a (b) 0 (c) 1 (d) a

17. Solve $(D^2+1)\,y = 0$ given $y(0) = 0,\ y'(0) = 1$
    (a) $y = \sin x$ (b) $y = \cos x$ (c) $y = A\cos x + B\sin x$ (d) $y = 0$

18. The P.I of $(D-2)^2y = e^{2x}$ is
    (a) $\frac{x^2}{2}\,e^{2x}$ (b) $\frac{x}{4}\,e^{2x}$ (c) $\frac{x^2}{2}\,e^{-2x}$ (d) $\frac{x^2}{2}\,e^{-2x}$

19. The P.I of $(D^2+4)y = \sin(2x+5)$ is
    (a) $-\frac{x}{2}\sin(2x+5)$ (b) $\frac{x}{4}\sin(2x+5)$ (c) $-\frac{x}{4}\cos(2x+5)$ (d) $\frac{x}{2}\cos(2x+5)$

20. Solve $(x^2D^2+xD+1)\,y = 0$ is
    (a) $Ae^{az}+Be^{bz}$ (b) $A\cos z + B\sin z$ (c) $(Az+B)e^{az}$ (d) $(Az+B)e^{-az}$

21. The roots of the auxiliary equation $(m^2-4) = 0$ are
    (a) ± 2 (b) $\pm 2i$ (c) $\pm\sqrt{2}$ (d) $1 \pm 2i$

22. The solution of $(x^2D^2-7xD+12)\,y = 0$ is
    (a) $Ae^{-2z}+Be^{6z}$ (b) $Ae^{2z}+Be^{-6z}$ (c) $Ae^{2z}+Be^{6z}$ (d) $Ae^{-2z}+Be^{-6z}$

23. If $y_1 = \cos x, y_2 = \sin x$ then the value of $y_1y_2' - y_2y_1'$ is
    (a) -1 (b) 0 (c) 1 (d) $\frac{1}{2}$

24. If three roots of the auxiliary equation become equal to the real number a, then the corresponding C.F is
    (a) $(Ax^2+Bx+C)\,e^{ax}$ (b) $Ae^{ax}+Be^{ax}+Ce^{ax}$ (c) $Ae^{ax}+(B\cos ax + C\sin ax)$ (d) a

25. The values of $\frac{e^{ax}}{D-a}$
    (a) xe^{ax} (b) e^{ax} (c) x^2e^{ax} (d) $\frac{x^2}{2}e^{ax}$

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Answers:

1. *a* **2.** *a* **3.** *a* **4.** *a* **5.** *a* **6.** *a* **7.** *d* **8.** *b* **9.** *c* **10.** *b* **11.** *a*
12. *a* **13.** *c* **14.** *b* **15.** *b* **16.** *d* **17.** *a* **18.** *a* **19.** *c* **20.** *b* **21.** *b*
22. *c* **23.** *c* **24.** *a* **25.** *a*