All Branches Hinglish

Subject: Engineering Mathematics

DPP-04

Chapter: Differential Equation

Topic : Partial Differential Equations, 1D & 2D heat equation & Laplace equation, Cauchy's & Legendre's homogenous LDE, Variation of Parameters

1. The general solution of $\frac{d^2y}{dx^2} - \frac{dy}{dx} - 2y = 10\cos x$ is

(a) $y = c_1e^{-x} + c_2e^{2x} - 3\cos x - \sin x$
(b) $y = c_1e^{x} + c_2e^{2x} - 3\cos x$
(c) $y = c_1^{-x} + c_2e^{2x} - 3x + \sin x$
(d) $y = c_1e^{x} + c_2e^{-2x} - 3\cos x - \sin x$

2. The solution of the equation $x^2\frac{d^2y}{dx^2} - 3x\frac{dy}{dx} + 4y = 0$ is

(a) $y = (c_1 + c_2x)e^{2x}$
(b) $y = (c_1 + c_2x)e^{x}$
(c) $y = (c_1 + c_2x)\log x$
(d) $y = (c_1 + c_2\log x)x^2$

3. The solution of the equation

$xp + 2y = pxy, \left(p = \frac{dy}{dx}\right)$ is

(a) $xy^2 = Ae^y$
(b) $xy^2 = Ae^x$
(c) $x^2y = Ae^y$
(d) $xy = Ae^y$

4. If $y = x$ is a solution of $x^2y'' + xy' - y = 0$, then the second linearly independent solution of the above equation is

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

5. The family of conic represented by the solution of the DE $(4x + 3y + 1)dx + (3x + 2y + 1)dy = 0$ is

(a) Circles (b) Parabolas
(c) Hyperbolas (d) Ellipses

6. Consider the following second-order differential equation:

$y'' - 4y' + 3y = 2t - 3t^2$

The particular solution of the differential equation is

(a) $-2 - 2t - t^2$ (b) $-2t - t^2$
(c) $2t - 3t^2$ (d) $-2 - 2t - 3t^2$

7. The differential equation $\frac{d^2y}{dx^2} + 16y = 0$ for $y(x)$ with the two boundary conditions $\left.\frac{dy}{dx}\right|_{x=0} = 1$ and $\left.\frac{dy}{dx}\right|_{x=\frac{\pi}{2}} = -1$ has

(a) No solution
(b) Exactly two solutions
(c) Exactly one solution
(d) Infinitely many solutions

8. Consider the differential equation $3y''(x) + 27y(x) = 0$ with initial conditions $y(0) = 0$ and $y'(0) = 2000$. The value of y at $x = 1$ is ______.

9. The general solution of the differential equation

$\frac{d^4y}{dx^4} - 2\frac{d^3y}{dx^3} + 2\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = 0$

(a) $y = (c_1 - c_2x)e^x + c_3\cos x + c_4\sin x$
(b) $y = (c_1 + c_2x)e^x - c_3\cos x + c_4\sin x$
(c) $y = (c_1 + c_2x)e^x + c_3\cos x + c_4\sin x$
(d) $y = (c_1 + c_2x)e^x + c_3\cos x - c_4\sin x$

10. The solution of the differential equation $\frac{d^2y}{dx^2} - \frac{dy}{dx} - 2y = 3e^{2x}$, where, $y(0) = 0$ and $y'(0) = -2$ is

(a) $y = e^{-x} - e^{2x} + xe^{2x}$
(b) $y = e^{x} - e^{-2x} - xe^{2x}$
(c) $y = e^{-x} + e^{2x} + xe^{2x}$
(d) $y = e^{x} - e^{-2x} + xe^{2x}$

11. Consider the differential equation $\frac{dy}{dx} = (1 + y^2)x$. The general solution with constant c is

(a) $y = \tan\frac{x^2}{2} + \tan c$

(b) $y = \tan^2\left(\frac{x}{2} + c\right)$

(c) $y = \tan^2\left(\frac{x}{2}\right) + c$

(d) $y = \tan\left(\frac{x^2}{2} + c\right)$

12. The solution of $x\frac{dy}{dx} + y = x^4$ with the condition $y(1) = \frac{6}{5}$ is

(a) $y = \frac{x^4}{5} + \frac{1}{x}$

(b) $y = \frac{4x^4}{5} + \frac{4}{5x}$

(c) $y = \frac{x^4}{5} + 1$

(d) $y = \frac{x^5}{5} + 1$

13. The integrating factor of the equation $(x^2y^3 + xy)\frac{dy}{dx} = 1$ is

(a) ey^2

(b) $e^{\frac{1}{2}y^2}$

(c) $e^{\frac{1}{2}x^2}$

(d) $e^{-\frac{1}{2}y^2}$

14. The general integral of the partial differential equation $y^2p - xyq = x(z - 2y)$ is
(a) $\phi(x^2 + y^2, y^2 - yz) = 0$
(b) $\phi(x^2 - y^2, y^2 + yz) = 0$
(c) $\phi(xy, yz) = 0$
(d) $\phi(x + y, \ln x - z) = 0$

15. Match each differential equation in Group I to its family of solution curves from Group II

Group I		**Group II**
A.	$\frac{dy}{dx} = \frac{y}{x}$	1. Circles
B.	$\frac{dy}{dx} = -\frac{y}{x}$	2. Straight lines
C.	$\frac{dy}{dx} = \frac{x}{y}$	3. Hyperbolas
D.	$\frac{dy}{dx} = -\frac{x}{y}$	

(a) A – 2, B – 3, C – 3, D – 1
(b) A – 1, B – 3, C – 2, D – 1
(c) A – 2, B – 1, C – 3, D – 3
(d) A – 3, B – 2, C – 1, D – 2

16. The one dimensional heat conduction partial differential equation $\frac{\partial T}{\partial t} = \frac{\partial^2 T}{\partial x^2}$ is
(a) parabolic (b) hyperbolic
(c) elliptic (d) mixed

17. The partial differential equation
$\frac{\partial^2\phi}{\partial x^2} + \frac{\partial^2\phi}{\partial y^2} + \frac{\partial\phi}{\partial x} + \frac{\partial\phi}{\partial y} = 0$ has
(a) degree 1 and order 2
(b) degree 1 and order 1
(c) degree 1 and order 1
(d) degree 2 and order 2

18. The type of partial differential equation $\frac{\partial^2 P}{\partial x^2} + \frac{\partial^2 P}{\partial y^2} + 3\frac{\partial^2 P}{\partial x dy} + 2\frac{\partial P}{\partial x} - \frac{\partial P}{\partial y} = 0$ is
(a) elliptic (b) parabolic
(c) hyperbolic (d) none of these

19. The solution of the following partial differential equation $\frac{\partial^2 u}{\partial x^2} = 9\frac{\partial^2 u}{\partial y^2}$ is
(a) $\sin(3x - y)$ (b) $3x^2 + y^2$
(c) $\sin(3x - 3y)$ (d) $(3y^2 - x^2)$

20. The complete integral of $(z - px - qy)^3 = pq + 2(p^2 + q)^2$ is

(a) $z = ax + by + \sqrt[3]{pq + 2(p^2 + q)^2}$

(b) $z = ax + by + \sqrt[3]{ab + 2(a^2 + b)^2}$

(c) $z = ax + by + \sqrt[3]{ab} + \sqrt[3]{2(a^2 + b)^2}$

(d) $z = ax + by + c$

Answer Key

1. (a)
2. (d)
3. (c)
4. (a)
5. (c)
6. (a)
7. (a)
8. (94.08)
9. (c)
10. (a)
11. (d)
12. (a)
13. (b)
14. (a)
15. (a)
16. (a)
17. (a)
18. (c)
19. (a)
20. (b)