

CHAPTER-9
DIFFERENTIAL EQUATIONS
01 MARK TYPE QUESTIONS

Q. NO	QUESTION	MARK
1.	<p>Solution of differential equation $xdy - ydx = Q$ represents:</p> <p>(a) a rectangular hyperbola</p> <p>(b) parabola whose vertex is at the origin</p> <p>(c) straight line passing through the origin</p> <p>(d) a circle whose centre is at the origin</p>	1
2.	<p>Given the differential equation $\frac{dy}{dx} = \frac{6x^2}{2y + \cos y}$ $y(1) = \pi$</p> <p>(a) Solution is $y^2 - \sin y = -2x^3 + c$</p> <p>(b) Solution of $y^2 + \sin y = 2x^3 + c$</p> <p>(c) $C = \pi^2 + 2$</p> <p>(d) $C = \pi^2 - 2$</p>	1
3.	<p>The differential equation of all parabolas whose axis of symmetry is along the axis of the x-axis is of order</p> <p>(a) 3</p> <p>(b) 1</p> <p>(c) 2</p> <p>(d) none of these</p>	1
4.	<p>The degree of the equation satisfying the relation</p> $\sqrt{1+x^2} + \sqrt{1+y^2} = \lambda x(\sqrt{1+y^2} - y(\sqrt{1+x^2}))$ <p>(a) 1</p> <p>(b) 2</p> <p>(C) 3</p> <p>(d) 4</p>	1
5.	<p>The order and degree of the differential equation $\left(\frac{d^2y}{dx^2}\right) + \left(\frac{dy}{dx}\right)^{\frac{1}{4}} + x^{\frac{1}{5}} = 0$</p> <p>Respectively are</p> <p>(a) 2 and not defined</p> <p>(b) 2 and 2</p> <p>(c) 2 and 3</p> <p>(d) 3 and 3</p>	1
6.	<p>Integrating factor of the differential equation $\frac{dy}{dx} + y \tan x - \sec x = 0$ is</p> <p>(a) $\cos x$</p> <p>(b) $\sec x$</p> <p>(c) $e^{\cos x}$</p> <p>(d) $e^{\sec x}$</p>	1
7.	<p>The number of arbitrary constants in the particular solution of a differential equation of third order is:</p> <p>(a) 3</p> <p>(b) 2</p>	1

	(c) 1 (d) 0	
8.	The differential equation satisfied by $y = \frac{A}{x} + B$ is (A, B are parameters) (a) $x^2 y_1 = y$ (b) $xy_1 + 2y_2 = 0$ (c) $xy_2 + 2y_1 = 0$ (d) none	1
9.	The curve for which the slope of the tangent at any point is equal to the ratio of the abscissa to the ordinate of the point is: (a) Ellipse (b) Parabola (c) Circle (d) Rectangular hyperbola	1
10.	The order of differential equations of all circles of given radius 4 (a) 3 (b) 2 (c) 1 (d) 0	1
11.	The differentialequation $y \log y \, dx - xdy = 0$ is (i) variable separable differential equation (ii) homogeneous differential equation (iii) First order linear differential equation (iv) none of these	1
12.	The integrating factor of the differential equation $x \frac{dy}{dx} + y = x^3$ is (i) x (ii) $\log x$ (iii) i/x (iv) 0 none of these	1
13.	The degree of the differential equation $x^2 + \left(\frac{dy}{dx}\right)^2 = 5$ is (i) 2 (ii) 3 (iii) 1 (iv) none of these	1
14.	A solution of the differential equation $\left(\frac{dy}{dx}\right)^2 - x \frac{dy}{dx} + y = 0$ is (i) $y=2$ (ii) $y=2x$ (iii) $y=2x-4$ (iv) none of these	1
15.	The integrating factor of $\frac{dy}{dx} - y = 1$ is (i) e^x (ii) e^{-x} (iii) $-e^{-x}$ (iv) none of these	1
16.	The sum of the order and degree of the differential equation $\frac{d^2 y}{dx^2} + \left(\frac{dy}{dx}\right)^3 = \sin y$ is (i) 1 (ii) 2 (iii) 3 (iv) 4	1
17.	What is the product of the order and degree of the differential equation $\frac{d^2 y}{dx^2} \sin y + \left(\frac{dy}{dx}\right)^3 \cos y = \sqrt{y}$	1

	(i)3 (ii) 2 (iii) 6 (iv) not defined	
18.	The solution of the differential equation $2x \frac{dy}{dx} - y = 3$ represents a family of (i) Straight lines (ii) circles (iii) parabolas (iv) ellipses	1
19.	The general solution of the differential equation $xy - (1+x^2) dx = x$ is (i) $y = 2x + x^3/3 + C$ (ii) $y = 2\log x + x^3/2 + C$ (iii) $y = 2x + x^2/3 + C$ (iv) none of these	1
20.	The solution of $\frac{dy}{dx} - y = 1$, $y(0) = 1$ is given by (i) $xy = -e$ (ii) $xy = -e^{-x}$ (iii) $xy = -1$ (iv) $y = 2e^x - 1$	1
21.	The degree of the differential equation $\left(\frac{d^2y}{dx^2}\right)^3 + \left(\frac{dy}{dx}\right)^2 + \sin\left(\frac{dy}{dx}\right) + 1 = 0$, is a)3 b)2 c)1 d)not defined	1
22.	The degree of the differential equation $x = 1 + \frac{dy}{dx} + \frac{1}{2!}\left(\frac{dy}{dx}\right)^2 + \frac{1}{3!}\left(\frac{dy}{dx}\right)^3 + \dots$, is a)3 b)1 c)not defined d)none of these	1
23.	The order of the differential equation $\left(\frac{d^2r}{dt^2}\right)^2 + 3\left(\frac{dr}{dt}\right)^3 + 4 = 0$ is a)2 b)1 c)3 d)4	1
24.	The differential equation $\left(\frac{d^2y}{dx^2}\right)^{\frac{2}{3}} = \left(y + \frac{dy}{dx}\right)^{\frac{1}{2}}$ is of a)second order, fourth degree b)first order, fourth degree c)second order, third degree d)second order, second degree	1
25.	The number of arbitrary constants in the general solution of a differential equation of fourth order are a)0 b)2 c)3 d)4	1
26.	The order of the differential equation whose general solution is given by $y = (c_1 + c_2)\sin(x + c_3) - c_4e^{x+c_5}$ is a)5 b)4 c)3 d)2	1
27.	The solution of the differential equation $\frac{dy}{dx} + \sqrt{\frac{1-y^2}{1-x^2}} = 0$ is	1

	a) $\tan^{-1} x + \cot^{-1} x = C$ b) $\sin^{-1} x + \sin^{-1} y = C$ c) $\sec^{-1} x + \operatorname{cosec}^{-1} x = C$ d) none of these	
28.	The number of arbitrary constants in the particular solution of a differential equation of third order are a) 3 b) 2 c) 1 d) 0	1
29.	Which of the following is a homogeneous differential equation? (A) $(4x + 6y + 5) dy - (3y + 2x + 4) dx = 0$ (B) $(xy)dx - (x^3 + y^3) dy = 0$ (C) $(x^3 + 2y^2) dx + 2xy dy = 0$ (D) $y^2 dx + (x^2 - xy - y^2) dy = 0$	1
30.	The Integrating Factor of the differential equation $x \frac{dy}{dx} - y = 2x^2$ is (A) e^{-x} (B) e^{-y} (C) $1/x$ (D) x .	1
31.	The sum of order and degree of the differential equation $x^3 \left(\frac{d^2 y}{dx^2} \right)^2 + x \left(\frac{dy}{dx} \right)^4 = 0$ is (a) 6 (b) 2 (c) 4 (d) 3	1
32.	The order and degree of the differential equation $\frac{d^2 y}{dx^2} + \left(\frac{dy}{dx} \right)^{1/4} + x^{1/5} = 0$ respectively are (a) 2 and 4 (b) 2 and 2 (c) 2 and 3 (d) 3 and 3	1
33.	Which of the following is a second order differential equation? (a) $(y')^2 + x = y^2$ (b) $y' y'' + y = \sin x$ (c) $y''' + (y'')^2 + y = 0$ (d) $y' = y^2$	1
34.	The numbers of arbitrary constant in the general solution of a differential equation of fourth order are: (a) 0 (b) 2 (c) 3 (d) 4	1
35.	The numbers of arbitrary constant in the particular solution of a differential equation of second order are: (a) 0 (b) 2 (c) 3 (d) 4	1
36.	A differential equation of the form $\frac{dy}{dx} = F(x, y)$ where $F(x, y)$ is a homogeneous function of degree zero. Differential equation of the form $\frac{dy}{dx} = f\left(\frac{x}{y}\right)$ is a homogeneous differential equation of degree : (a) 0 (b) 1 (c) 2 (d) not defined	1
37.	The integrating factor of differential equation $\cos x \frac{dy}{dx} + y \sin x = 1$ is (a) $\cos x$ (b) $\tan x$ (c) $\sec x$ (d) $\sin x$	1
38.	The solution of differential equation $x dy - y dx = 0$ represents (a) a rectangular hyperbola (b) parabola whose vertex is at origin (c) straight line passing through origin (d) a circle whose centre is at origin	1
39.	A function $F(x, y)$ is a homogeneous function of degree n , if (a) $f(x, y) = x^n f\left(\frac{y}{x}\right)$ (b) $f(x, y) = y^n g\left(\frac{x}{y}\right)$	1

	(c) Both a and b	(d) $f(x, y) = x^{-n} f\left(\frac{y}{x}\right)$	
40.	For what value of n is the following a homogeneous differential equation : $\frac{dy}{dx} = \frac{x^3 - y^n}{x^2 y + x y^2}$ (a) 4 (b) 3 (c) 2 (d) 1		1
41.	The order and degree of the differential equation $x^2 \frac{d^2 y}{dx^2} = \left\{1 + \left(\frac{dy}{dx}\right)^2\right\}^4$ is A. 1, 1 B. 2, 4 C. 2, 1 1, 4		1
42.	The order and degree of the differential equation $x^3 \left(\frac{d^2 y}{dx^2}\right)^2 + x \left(\frac{dy}{dx}\right)^4 = 0$ is A. 2, 1 B. 2, 2 C. 4, 2 2, 2		1
43.	The degree of the differential equation $\frac{d^2 y}{dx^2} + x \left(\frac{dy}{dx}\right)^2 = 2x^2 \log \left(\frac{d^2 y}{dx^2}\right)$ is A. 2 B. 1 C. Not Defined 3		1
44.	The order and degree of the differential equation $\left(\frac{d^4 y}{dx^4}\right)^2 = \left\{x + \left(\frac{dy}{dx}\right)^2\right\}^3$ is A. 2, 2 B. 2, 4 C. 2, 6 4, 2		1
45.	The sum of the degree and the order of the following differential equation: $\frac{d}{dx} \left[\left(\frac{d^2 y}{dx^2}\right)^4 \right] = 0$ is A. 6 B. 3 C. 5 4		1
46.	The sum of the order and degree of the following differential equation: $y = x \left(\frac{dy}{dx}\right)^3 + \frac{d^2 y}{dx^2}$ is A. 5 B. 4 C. 3 2		1
47.	The integrating factor of the differential equation $x \frac{dy}{dx} - 2y = 2x^2$ is A. $\frac{1}{x}$ B. $\frac{1}{x^2}$ C. $\ln x$ e^x		1
48.	The integrating factor of the differential equation $(y - x)dy = (1 + y^2)dx$ is A. $e^{\tan^{-1} x}$ B. $e^{\tan^{-1} y}$ C. $\tan^{-1} x$ $\tan^{-1} y$		1
49.	The number of arbitrary constants in the general solution of a fourth order differential		1

	equation is A. 0 B. 2 C. 3 4	
50.	The number of arbitrary constants in the particular solution of a fourth order differential equation is A. 0 B. 2 C. 3 4	1
51.	Determine the order of differential equation $\frac{d^4 y}{dx^4} + \tan(y'') = 5$ (A) 4 (B) 2 (C) 1 (D) Not Defined	1
52.	Check which of the given function is a solution of the following differential equation $y'' - y' = 0$ (A) $y = \sqrt{1 + x^2}$ (B) $y = e^x + 1$ (C) $xy = \log y + C$ (D) $y - \cos y = x$	1
53.	The number of arbitrary constants in the general solution of a differential equation of third order are 0 (B) 2 (C) 4 (D) 3	1
54.	Find the degree of the following differential equation $\left(\frac{d^2 y}{dx^2}\right)^2 + \cos\left(\frac{dy}{dx}\right) = 0$ (A) 2 (B) 1 (C) (D) Not Defined	1
55.	A homogeneous differential equation of the form $\frac{dy}{dx} = f\left(\frac{y}{x}\right)$ can be solved by making the substitution (A) $y = vx$ (B) $v = yx$ (C) $x = vy$ (D) $y = v$	1
56.	The Integrating factor of the differential equation $(1 + x^2) \frac{dy}{dx} + 2xy = \frac{1}{1+x^2}$ is (A) $1 - x^2$	1

	<p>(B) $\frac{1}{1+x^2}$</p> <p>(C) $1+x^2$</p> <p>(D) e^{1+x^2}</p>	
57.	<p>The general solution of the differential equation $e^x dy + (ye^x + 2x)dx = 0$ is</p> <p>(A) $xe^y + x^2 = C$</p> <p>(B) $xe^y + y^2 = C$</p> <p>(C) $ye^x + x^2 = C$</p> <p>(D) $ye^y + x^2 = C$</p>	1
58.	<p>The Integrating factor of the differential equation $x \frac{dy}{dx} - y = 2x^2$ is</p> <p>(A) e^{-x}</p> <p>(B) e^{-y}</p> <p>(C) $\frac{1}{x}$</p> <p>(D) x</p>	1
59.	<p>The general solution of the differential equation $\frac{dy}{dx} = e^{x+y}$ is</p> <p>(A) $e^x + e^{-y} = C$</p> <p>(B) $e^x + e^y = C$</p> <p>(C) $e^{-x} + e^y = C$</p> <p>(D) $e^{-x} + e^{-y} = C$</p>	1
60.	<p>The number of arbitrary constants in the particular solution of a differential equation of fifth order are</p> <p>5 (B) 2 (C) 3 (D) 0</p>	1
61.	<p>The order of the differential equation $2x^2 d^2y/dx^2 - 3dy/dx + y = 0$ is</p> <p>(a) 2</p> <p>(b) 1</p> <p>(c) 0</p> <p>(d) not defined</p>	1
62.	<p>The degree of differential equation $1 + \left(\frac{dy}{dx}\right)^2 = x$ is</p> <p>(a) 1</p> <p>(b) 2</p> <p>(c) 3</p> <p>(d) not defined</p>	1
63.	<p>The order and degree of the differential equation $X\sqrt{1-y^2}dx + y\sqrt{1-x^2}dy = 0$ are respectively.</p> <p>(a) 1 and 1</p> <p>(b) 1 and 2</p>	1

	(c) 2 and 1 (d) 1 and 3	
64.	The order and degree (if defined) of the differential equation $d^2y/dx^2 + x(d\frac{dy}{dx})^2 = 2x^2 \log(d^2y/dx^2)$ (a) 2 and 3 (b) 2 and 1 (c) 2 and not defined (d) None of these	1
65.	The number of arbitrary constants in the particular solution of a differential equation of second order is(are) (a) 0 (b) 1 (c) 2 (d) 3	1
66.	The differential equation $Y\frac{dy}{dx} + x = C$ represents (a) family of hyperbolas (b) family of parabolas (c) family of ellipses (d) family of circles	1
67.	Which of the following is not a homogeneous function of x and y (a) $x^2 + 2xy$ (b) $2x - y$ (c) $\cos^2(\frac{y}{x}) + \frac{y}{x}$ (d) $\sin x - \cos y$	1
68.	If the slope of the tangent to the curve at any point P(x,y) is $\frac{y}{x} - \cos^2 \frac{y}{x}$, then the equation of a curve passing through $(1, \frac{\pi}{4})$ is (a) $\tan(\frac{y}{x}) + \log x = 1$ (b) $\tan(\frac{y}{x}) + \log y = 1$ (c) $\tan(\frac{x}{y}) + \log x = 1$ (d) $\tan(\frac{x}{y}) + \log y = 1$	1 1
69.	The integrating factor of $(\sin x)\frac{dy}{dx} + (2\cos x)y = \sin x \cos x$ is (a) $\sec x$ (b) $(\sin x)^2$ (c) $(\csc x)^2$ (d) $(\tan x)^2$	1
70.	The general solution of the differential equation $e^{2x}\frac{dy}{dx} + 3e^{2x}y = 1$ is (a) $ye^{3x} = e^x + C$ (b) $ye^{3x} = e^{-x} + C$ (c) $ye^{3x} = -e^x + C$ (d) $ye^x = e^{3x} + C$	1

ANSWERS:

Q. NO	ANSWER	MARKS
1.	c	1
2.	b	1
3.	c	1
4.	a	1
5.	a	1
6.	b	1
7.	d	1
8.	c	1
9.	d	1
10.	b	1
11.	i	1
12.	i	1
13.	iii	1
14.	iii	1
15.	ii	1
16.	iii	1
17.	ii	1
18.	i	1
19.	iv	1
20.	iv	1
21.	D	1
22.	C	1
23.	A	1
24.	A	1
25.	D	1
26.	C	1
27.	B	1
28.	D	1
29.	D	1
30.	C	1
31.	C	1
32.	A	1
33.	B	1
34.	D	1
35.	A	1
36.	B	1
37.	C	1
38.	C	1
39.	C	1
40.	B	1
41.	Order = 2, Degree = 1	1
42.	Order = 2, Degree = 2	1
43.	Degree = Not Defined	1

44.	Order = 4, Degree = 2	1
45.	$\frac{d}{dx} \left[\left(\frac{d^2 y}{dx^2} \right)^4 \right] = 0$ $\Rightarrow 4 \cdot \left(\frac{d^2 y}{dx^2} \right)^3 \cdot \frac{d^3 y}{dx^3} = 0$ $\Rightarrow \left(\frac{d^2 y}{dx^2} \right)^3 \frac{d^3 y}{dx^3} = 0$ Order = 3, Degree = 1 Order + Degree = 3 + 1 = 4	1
46.	Order + Degree = 2 + 1 = 3	1
47.	$x \frac{dy}{dx} - 2y = 2x^2$ $\Rightarrow \frac{dy}{dx} - \frac{2y}{x} = 2x \dots (i)$ $\frac{dy}{dx} + Py = Q \dots (ii)$ On comparison, we get $P = -\frac{2}{x}, Q = 2x$ Integrating Factor (I. F) = $e^{\int p dx} = e^{\int -\frac{2}{x} dx} = e^{-2 \log x } = e^{\log \frac{1}{x^2} } = \frac{1}{x^2}$	1
48.	$(\tan^{-1} y - x) dy = (1 + y^2) dx$ $\Rightarrow (\tan^{-1} y - x) = (1 + y^2) \frac{dx}{dy}$ $\Rightarrow \frac{dx}{dy} = \frac{(\tan^{-1} y - x)}{(1 + y^2)}$ $\Rightarrow \frac{dx}{dy} + \frac{x}{1 + y^2} = \frac{\tan^{-1} y}{1 + y^2} \dots (i)$ $\frac{dx}{dy} + Px = Q \dots (ii)$ On comparison, we get $P = \frac{1}{1 + y^2}, Q = \frac{\tan^{-1} y}{1 + y^2}$ Integrating Factor (I. F) = $e^{\int p dy} = e^{\int \frac{dy}{1+y^2}} = e^{\tan^{-1} y}$	1
49.	4	1
50.	0	1
51.	A	1
52.	B	1
53.	D	1
54.	D	1
55.	A	1
56.	C	1
57.	C	1
58.	C	1
59.	A	1
60.	D	1

61.	(a)	1
62.	(b)	1
63.	(a)	1
64.	(c)	1
65.	(a)	1
66.	(d)	1
67.	(d)	1
68.	(a)	1
69.	(b)	1
70.	(a)	1