EXERCISE LEVEL – I

EL– I

Q.1 Which of the following functions satisfies the differential equation $\frac{dy}{dx}+2y=0$?

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

Q.2 The function $y = 8\sin^2 x$ is a solution to the differential equation $\frac{d^2y}{dx^2}+4y=0$.

(a) True (b) False

Q.3 Which of the following functions satisfies the differential equation $xy' - y = 0$?

(a) $y = 4x$ (b) $y=x^2$ (c) $y=-4x$ (d) $y=2x$

Q.4 Which of the following differential equations is satisfied by the solution $y = 3x^2$?

(a) $\frac{d^2y}{dx^2}-6x=0$ (b) $\frac{dy}{dx}-3x=0$

(c) $x\frac{d^2y}{dx^2}-\frac{dy}{dx}=0$ (d) $\frac{d^2y}{dx^2}-\frac{3dy}{dx}=0$

Q.5 Which of the following functions satisfies the differential equation $y'' + 6y = 0$?

(a) $y = 5\cos 3x$ (b) $y = 5\tan 3x$

(c) $y = \cos 3x$ (d) $y = 6\cos 3x$

Q.6 Which function among the following is a solution to the differential equation $\frac{dy}{dx} - 14x = 0$?

(a) $y = 7x^2$ (b) $y = 7x^3$ (c) $y = x^7$ (d) $y = 14x$

Q.7 Which of the following given differential equations has $y = \log x$ as a solution?

(a) $\frac{d^2y}{dx^2}-x=0$ (b) $\frac{d^2y}{dx^2}+\left(\frac{dy}{dx}\right)^2=0$

(c) $\frac{d^2y}{dx^2}-\frac{dy}{dx}=0$ (d) $x\frac{d^2y}{dx^2}-\log x=0$

Q.8 How many arbitrary constants will be present in the general solution of a second-order differential equation?

(a) 3 (b) 4 (c) 2 (d) 1

Q.9 The count of arbitrary constants in a specific solution of a fourth-order differential equation is ___

(a) 1 (b) 0 (c) 4 (d) 3

Q.10 The function $y = 3\cos x$ is a solution to the equation $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} = 0$

(a) True (b) False

Q.11 Degree of the differential equation $e^{dy/dx} = x$ is

(A) 1 (B) 2

(C) 3 (D) Zero

Q.12 The order of the differential equation whose solution is given by
$y = c_1 x + (c_2 + c_3)e^{\log x} + c_4 \cos(x + c_5)$
where c_1, c_2, c_3, c_4 and c_5 are arbitrary constants, is

(A) 2 (B) 3

(C) 4 (D) 5

Q.13 The differential equation of all circles at fixed centre (α, β) is

(A) $\frac{dy}{dx} = (x - \alpha)(y - \beta)$ (B) $\frac{dy}{dx} = \frac{x-\alpha}{y-\beta}$

(C) $\frac{dy}{dx} = \frac{\alpha - x}{y - \beta}$ (D) $\frac{dy}{dx} = \frac{x-\alpha}{\beta - y}$

Q.14 The order of the differential equation of ellipse whose minor and minor axes are along x-axis and y-axis respectively, is

(A) 1 (B) 2

(C) 3 (D) 4

Q.15 The differential equation satisfying all the curves $y = ae^{2x} + be^{-3x}$
where a and b are arbitrary constants, is

(A) $6y = y_1 + y_2$ (B) $y = y_1 + y_2$

(C) $6y = 2y_1 + 2y_2$ (D) $6y = y_1 - y_2$

Q.16 The degree of the differential equation $\frac{d^2y}{dx^2} + \sqrt{1 + (\frac{dy}{dx})^3} = 0$ is

(A) 1 (B) 2

(C) 3 (D) 6

Q.17 Which of the following differential equation is linear?

(A) $\sqrt{1-x^2}dx + \sqrt{1-y^2}dy = 0$ (B) $(\frac{ds}{dt})^4 + 3s\frac{d^2s}{dt^2} = 0$

(C) $\frac{1}{x}\frac{d^2y}{dx^2} = e^x$ (D) $(xy^2 + x)dx + (y - x^2y)dy = 0$

Q.18 The differential equation of all the non-vertical lines in the xy-plane is

(A) $\frac{dy}{dx} - x = 0$ (B) $\frac{d^2y}{dx^2} - x\frac{dy}{dx} = 0$

(C) $\frac{d^2y}{dx^2} = 0$ (D) $\frac{d^2y}{dx^2} + x = 0$

Q.19 The differential equation of the family of curves represented by the equation
$(x - a)^2 + y^2 = a^2$ is

(A) $2xy\frac{dy}{dx} + x^2 = y^2$ (B) $2xy\frac{dy}{dx} + x^2 + y^2 = 0$

(C) $xy\frac{dy}{dx} + x^2 = y^2$ (D) $x\frac{dy}{dx} + x^2 - y^2 = 0$

Q.20 The differential equation of the family of curves $v = \frac{A}{r} + B$, where A and B are arbitrary constants, is

(A) $\frac{d^2v}{dr^2} + \frac{1}{r}\frac{dv}{dr} = 0$
(B) $\frac{d^2v}{dr^2} - \frac{1}{r}\frac{dv}{dr} = 0$
(C) $\frac{d^2v}{dr^2} + \frac{2}{r}\frac{dv}{dr} = 0$
(D) $\frac{d^2v}{dr^2} + r\frac{dv}{dr} = 0$

Q.21 The general solution of differential equation $\frac{dy}{dx} = \frac{x+y}{x-y}$ is

(A) $\sqrt{x^2 + y^2} = c$
(B) $\tan^{-1}\left(\frac{y}{x}\right) = \log(c\sqrt{x^2 + y^2})$
(C) $x\tan^{-1}(\frac{y}{x}) = \log\sqrt{x^2 + y^2} + c$
(D) $y = x + c$

Q.22 If $x\frac{dy}{dx} = y(\log y - \log x + 1)$, then the solution of the equation is

(A) $\log\left(\frac{x}{y}\right) = cy$
(B) $\log\left(\frac{y}{x}\right) = cy$
(C) $\log\left(\frac{x}{y}\right) = cx^2$
(D) $\log\left(\frac{y}{x}\right) = cx$

Q.23 The slope of the tangent at (x, y) to a curve passing through $(2,1)$ is $\frac{x^2+y^2}{2xy}$, then the equation of the curve is

(A) $2(x^2 - y^2) = 3x$
(B) $2(x^2 - y^2) = 3x$
(C) $x(x^2 - y^2) = 6$
(D) $x(x^2 + y^2) = 10$

Q.24 Solution of the differential equation : $(2x\cos y + y^2\cos x)dx + (2y\sin x - x^2\sin y)dy = 0$ is

(A) $x^2\sin x + y^2\cos x = c$
(B) $x^2\sin y + y^2\cos x = c$
(C) $x^2\cos y + y^2\sin x = c$
(D) $x^2\sin y - y^2\cos x = c$

Q.25 Solution of the differential equation $(3xy^2 + x\sin(xy))dy + (y^3 + y\sin(xy))dx = 0$ is

(A) $xy^3 - \cos xy = c$
(B) $xy^3 + \cos xy = c$
(C) $xy^2 - \cos xy = c$
(D) $xy^2 + \sin xy = c$

Q.26 The solution of the differential equation $(1 + x^2)(1 + y)dy + (1 + x)(1 + y^2)dx = 0$ is

(A) $\tan^{-1}x + \log(1 + x^2) + \tan^{-1}y + \log(1 + y^2) = c$
(B) $\tan^{-1}x - \frac{1}{2}\log(1 + x^2) + \tan^{-1}y - \frac{1}{2}\log(1 + y^2) = c$
(C) $\tan^{-1}x + \frac{1}{2}\log(1 + x^2) + \tan^{-1}y + \frac{1}{2}\log(1 + y^2) = c$
(D) $\tan^{-1}x + \frac{1}{2}\log(1 + x^2) - \tan^{-1}y + \frac{1}{2}\log(1 + y^2) = c$

Q.27 The solution of $\frac{dy}{dx} = (4x + y + 1)^2$ is

(A) $4x - y + 1 = 2\tan(2x + 2c)$
(B) $4x - y - 1 = 2\tan(2x + 2c)$
(C) $4x + y + 1 = 2\tan(2x + 2c)$
(D) $y = 3x + c$

Q.28 The solution of $ydx - xdy + 3x^2y^2e^{x^3}dx = 0$ is

(A) $\frac{x}{y} + e^{x^3} = c$
(B) $\frac{x}{y} - e^{x^3} = c$
(C) $-\frac{x}{y} + e^{x^3} = c$
(D) $y = x^2 + c$

Q.29 The solution of the differential equation $3e^x\tan y dx + (1 + e^x)\sec^2 y dy = 0$ is

(A) $(1 + e^x)^3\tan y = c$
(B) $(1 - e^x)^3\tan y = -c$
(C) $(-1 + e^x)^3\tan y = -c$
(D) $y = x^3 + c$

Q.30 The slope of the tangent at (x, y) to a curve passing through $\left(1, \frac{\pi}{4}\right)$ is given by $\frac{y}{x} - \cos^2\left(\frac{y}{x}\right)$ then the equation of the curve is

(A) $y = \tan^{-1}\left(\log\left(\frac{e}{x}\right)\right)$ (B) $y = x\tan^{-1}\left(\log\left(\frac{x}{e}\right)\right)$

(C) $y = x\tan^{-1}\left(\log\left(\frac{e}{x}\right)\right)$ (D) $y = \log\left(\frac{x}{y}\right)$

Q.31 Integrating factor of the differential equation $\frac{dy}{dx} + \left(\frac{x}{1-x^2}\right)y = \sin x$ is

(A) $\sqrt{1-x^2}$ (B) $\frac{1}{1-x^2}$

(C) $\frac{1}{\sqrt{1-x^2}}$ (D) $y = \cos x$

Q.32 The solution of the differential equation $x\frac{dy}{dx} = -\frac{y}{2} - \frac{\sin 2x}{2y}$ is given by

(A) $xy^2 = \cos^2 x + c$ (B) $xy^2 = \sin^2 x + c$

(C) $yx^2 = \cos^2 x + c$ (D) $xy = \sin x + c$

Q.33 A spherical rain drop evaporates at a rate proportional to its surface area at any instant t. The rate of change of the radius of the rain droo is

(A) Proportional to radius (B) Proportional to surface area

(C) Proportional to volume (D) Constant

Q.34 If $y(t)$ is a solution of $(1+t)\frac{dy}{dt} - ty = 1$ and $y(0) = 1$, then $y(1)$ is equal to

(A) $\frac{e^2}{2}$ (B) $e + \frac{1}{2}$

(C) $e - \frac{1}{2}$ (D) $e^2 - \frac{1}{2}$

Q.35 The orthogonal trajectories of the family of curves $a^{n-1}y = x^n$ are given by

(A) $x^n + n^2y =$ constant (B) $ny^2 + x^2 =$ constant

(C) $n^2x + y^n =$ Constant (D) $y = x$

Q.36 One of the solution of the differential equation, $\left(\frac{dy}{dx}\right)^2 - x\frac{dy}{dx} + y = 0$ may be

(A) $y = 2$ (B) $y = 2x$

(C) $y = 2x - 4$ (D) $y = 2x^2 - 4$

Q.37 The equation of the curve passing through the origin and satisfying the differential equation $(1+x^2)\frac{dy}{dx} + 2xy = 4x^2$ is

(A) $(1+x^2)y = x^3$ (B) $2(1+x^2)y = 3x^3$

(C) $3(1+x^2)y = 4x^3$ (D) $x + y = x^2$

Q.38 The solution of the differential equation $y' = \frac{y}{x} + \frac{\phi\left(\frac{y}{x}\right)}{\phi'\left(\frac{y}{x}\right)}$ is

(A) $x\phi\left(\frac{y}{x}\right) = k$ (B) $\phi\left(\frac{y}{x}\right) = kx$

(C) $y\phi\left(\frac{y}{x}\right) = k$ (D) $\phi\left(\frac{y}{x}\right) = ky$

Q.39 The differential equation $\frac{d^2y}{dx^2} + x\frac{dy}{dx} + \sin y + x^2 = 0$, is which of the following types question mark

(A) Linear (B) Homogeneous

(C) Order two (D) Degree two

Q.40 If $y = y(x)$ satisfies $\frac{2+si}{1+y}\left(\frac{dy}{dx}\right) = -\cos x$, such that $y(0) = 1$, then $y\left(\frac{\pi}{2}\right)$ is equal to

(A) $\frac{3}{2}$ (B) $\frac{5}{2}$

(C) $\frac{1}{3}$ (D) 1

Q.41 If m, n are order and degree of differential equation $y\frac{dy}{dx} + x^3\left(\frac{d^2y}{dx^2}\right) - xy = \cos x$, then

(A) $m < n$ (B) $m = n$

(C) $m > n$ (D) $m - n = 3$

Q.42 The degree of the differential equation $\left[1 + \left(\frac{dy}{dx}\right)^2\right]^{\frac{3}{2}} = \frac{d^2y}{dx^2}$ is

(A) 4 (B) $\frac{3}{2}$

(C) Not defined (D) 2

Q.43 The order and degree of the differential equation whose general equation is $y = c(x - c)^2$ are

(A) 1, 1 (B) 1, 2

(C) 1, 3 (D) 2, 1

Q.44 The second order differential equation is

(A) $(y')^2 = y^2 - x$ (B) $y'y'' + y = \sin x$

(C) $y''' + y'' + y = 0$ (D) $y' = y$

Q.45 The order of differential equation of family of all concentric circles centered at (h, k) is

(A) 1 (B) 2

(C) 3 (D) 4

Q.46 Integrating factor of the differential equation $\cos x\frac{dy}{dx} + y\sin x = 1$ is

(A) $\cos x$ (B) $\tan x$

(C) $\sec x$ (D) $\sin x$

Q.47 Integrating factor of $x\frac{dy}{dx} - y = x^4 - 3x$ is

(A) x (B) $\log x$

(C) $\frac{1}{x}$ (D) $-x$

Q.48 The solution of differential equation $\cos x \cdot \sin y dx + \sin x \cdot \cos y dy = 0$ is

(A) $\frac{\sin x}{\sin y} = c$ (B) $\sin x \cdot \sin y = c$

(C) $\sin x + \sin y = c$ (D) $\cos x \cdot \cos y = c$

Q.49 If $\frac{dP}{dy} = 3^{\cos y}\sin y$, then P is equal to

(A) $\sin y + c$ (B) $3^{\cos y} + c$

(C) $\frac{-3^{\cos y}}{\ln 3} + c$ (D) $3^{\sin y} + c$

Q.50 The integration factor of equation $(x^2 + 1)\frac{dy}{dx} + 2xy = x^2 - 1$, is

(A) $x^2 + 1$ (B) $\frac{2x}{x^2+1}$

(C) $\frac{x^2-1}{x^2+1}$ (D) $1 - x^2$

Q.51 Which of the following differential equation has $y = x$ as one of its particular solution question mark

(A) $\frac{d^2y}{dx^2} - x^2\frac{dy}{dx} + xy = x$ (B) $\frac{d^2y}{dx^2} - x^2\frac{dy}{dx} + xy = 0$

(C) $\frac{d^2y}{dx^2} + x^2\frac{dy}{dx} + xy = x$ (D) $\frac{d^2y}{dx^2} + x\frac{dy}{dx} + xy = 0$

Q.52 Family $y = Ax + A^3$ of curves will correspond to a differential equation of order

(A) 3 (B) 2

(C) 1 (D) Not defined

Q.53 The differential equation representing the family of curves $y^2 = 2c(x + \sqrt{c})$ (where c is a positive parameter), is of

(A) Order 1, degree 3 (B) Order 1, degree 2

(C) Order 2, degree 3 (D) Order 2, degree 2

Q.54 The solution of $\frac{dy}{dx} + y = e^{-x}, y(0) = 0$ is

(A) $y = e^{-x}(x - 1)$ (B) $y = xe^{x}$

(C) $y = xe^{-x} + 1$ (D) $y = xe^{-x}$

Q.55 The general solution of differential equation $(e^x + 1)ydy = (y + 1)e^x dx$ is

(A) $y + 1 = k(e^x + 1)$ (B) $y + 1 = e^x + k$

(C) $y = \log\{k(y + 1)(e^x + 1)\}$ (D) $y = \log\left(\frac{e^x+1}{y+1}\right) + k$

Q.56 For solving $\frac{dy}{dx} = 4x + y + 1$, suitable substitution is

(A) $y = vx$ (B) $y = 4x$

(C) $y = 4x + v$ (D) $y + 4x + 1 = v$

Q.57 If y(t) is a solution of $(1 + t)\frac{dy}{dt} - ty = 1$ and $y(0) = -1$ then $y(1)$ equals,

(A) $-\frac{1}{2}$ (B) $e + \frac{1}{2}$

(C) $e - \frac{1}{2}$ (D) $\frac{1}{2}$

Q.58 STATEMENT-1: The degree of the differential equation, $e^{y''} - xy'' + y = 0$ is not defined.

And

STATEMENT - 2 : The differential equation mentioned in statement - 1 can't be written as a polynomial in derivatives.

(A)Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1

(B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1

(C) Statement-1 is True, Statement-2 is False

(D) Statement-1 is False, Statement-2 is True

Q.59 STATEMENT-1: The differential equation $\frac{dy}{dx} = \frac{2xy}{x^2+y^2}$ can't be solved by the substitution $x = vy$

And

STATEMENT-2: When the differential equation is homogeneous of first order and first degree, then the substitution that solves the equation is $y = vx$

(A)Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1

(B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1

(C) Statement-1 is True, Statement-2 is False

(D) Statement-1 is False, Statement-2 is True

Q.60 STATEMENT-1: The orthogonal trajectory of a family of circles touching x-axis at origin and whose center the on y-axis is self-orthogonal.

And

STATEMENT-2: In order to find the orthogonal trajectory of a family of curves we put $-\frac{dx}{dy}$ in place of $\frac{dy}{dx}$ in the differential equation of the given family of curves.

(A)Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1

(B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1

(C) Statement-1 is True, Statement-2 is False

(D) Statement-1 is False, Statement-2 is True

A tangent to a curve at P(x, y) intersects x-axis and y-axis at A and B respectively. Let the point of contact divides AB in the ratio $y^2 : x^2$. **(For questions 61 to 65)**

Q.61 The differential equation of family of curves is

(A) $x^2 + y^2 = c$ (B) $x^2 + y^2 - 2x = c$

(C) $x^2 + y^2 = cx^2y^2$ (D) $xy = c$

Q.62 If a member of this family passes through point (5,12) then area of this curve in square units is

(A) 25π (B) 144π

(C) 169π (D) 225π

Q.63 The centre of each member of this family is

(A) (0, 0) (B) (–2, 0)

(C) (0, 2) (D) (2, 2)

Q.64 If a member of this family passes through (3,4), then its equation is

(A) $x^2 + y^2 = 25$ (B) $x^2 + y^2 - 2x = 19$

(C) $x^2 + y^2 = 25x^2y^2$ (D) $x^2 + y^2 = 7$

Q.65 If a member of this family is passes through (3,4) then area bounded by this curve in square units is

(A) $\left(\frac{25}{4} + \frac{2\pi}{3}\right)$ (B) $2(\pi + 4)$

(C) 25π (D) $\left(16\pi + \frac{4}{5}\right)$

Q.66 The degree of the differential equation $\left(\frac{d^3y}{dx^3}\right)^{\frac{2}{3}} + 4 - 3\frac{d^2y}{dx^2} + 5\frac{d^3y}{dx^3} = 0$ is

(A) 1 (B) 2

(C) 3 (D) Not defined

Q.67 The differential equation for which $y = a\cos x + b\sin x$ is a solution is

(A) $\frac{d^2y}{dx^2} + y = 0$ (B) $\frac{d^2y}{dx^2} - y = 0$

(C) $\frac{d^2y}{dx^2} + (a + b)y = 0$ (D) $\frac{d^2y}{dx^2} + (a - b)y = 0$

Q.68 The degree of the differential equation of the curve $(x - a)^2 + y^2 = 16$ will be

(A) 0 (B) 2

(C) 3 (D) 1

Q.69 The differential equation of all parabolas with axis parallel to the axis of y is

(A) $y_2 = 2y_1 + x$ (B) $y_3 = 2y_1$

(C) ${y_2}^3 = y_1$ (D) $y_3 = 0$

Q.70 The differential equation of all circles passing through the origin and having their centers on the x - axis is

(A) $y^2 = x^2 - 2xy\frac{dy}{dx}$ (B) $x^2 = y^2 + xy\frac{dy}{dx}$

(C) $x^2 = y^2 + 3xy\frac{dy}{dx}$ (D) $y^2 = x^2 + 2xy\frac{dy}{dx}$

Q.71 Solution of the differential equation $xdy - ydx = 0$ represents

(A) A rectangular hyperbola

(B) Parabola whose vertex is at origin

(C) Straight line passing through origin

(D) A circle whose center is at origin

Q.72 Solution of the differential equation$\tan y \cdot \sec^2 xdx + \tan x \cdot \sec^2 ydy = 0$ is

(A) $\tan x + \tan y = k$ (B) $\tan x - \tan y = k$

(C) $\frac{\tan x}{\tan y} = k$ (D) $\tan x \cdot \tan y = k$

Q.73 The solution of differential equation $\frac{dy}{dx} + \frac{2xy}{1+x^2} = \frac{1}{(1+x^2)^2}$ is

(A) $y(1 + x^2) = c + \tan^{-1} x$

(B) $\frac{y}{1+x^2} = c + \tan^{-1} x$

(C) $y\log(1 + x^2) = c + \tan^{-1} x$

(D) $y(1 + x^2) = c + \cos^{-1} x$

Q.74 The solution of the equation $(2y - 1)dx - (2x + 3)dy = 0$ is $(x > -\frac{3}{2}, y > \frac{1}{2})$

(A) $\left(\frac{2x-1}{2y+3}\right) = k$ (B) $\frac{2y+1}{2x-3} = k$

(C) $\frac{2x+3}{2y-1} = k$ (D) $\frac{2x-1}{2y-1} = k$

Q.75 $\frac{dy}{dx} = \frac{xy+y}{xy+x}$, then the solution of differential equation is

(A) $y = xe^x + c$ (B) $y = e^x + c$

(C) $y = cxe^{x-y}$ (D) $y = x + c$

Q.76 The differential equation $y\frac{dy}{dx} + x = c$ represents

(A) Family of hyperbolas (B) Family of parabolas

(C) Family of ellipse (D) Family of circles

Q.77 The differential equation of family of curves$x^2 + y^2 - 2ay = 0$, where a. is an arbitrary constant is

(A) $(x^2 - y^2)\frac{dy}{dx} = 2xy$ (B) $2(x^2 + y^2)\frac{dy}{dx} = xy$

(C) $(x^2 - y^2)\frac{dy}{dx} = xy$ (D) $(x^2 + y^2)\frac{dy}{dx} = 2xy$

Q.78 The solution of differential equation $\frac{dy}{dx} = \frac{1+y^2}{1+x^2}$ is

(A) $y = \tan^{-1} x + c$ (B) $\tan^{-1} y = x + c$

(C) $(y - x) = c(1 + xy)$ (D) $\tan xy = c$

Q.79 Let $f(x) = \sec x. f(x), f(0) = 1$, then $f\left(\frac{\pi}{6}\right)$ equal to

(A) $\frac{1}{\sqrt{e}}$ (B) $\sqrt{e}$

(C) $e^{\frac{3}{2}}$ (D) $\frac{1}{2\sqrt{e}}$

Q.80 The solution of differential equation $\frac{dy}{dx} = \cos(x - y)$

(A) $y + \cot\left(\frac{x-y}{2}\right) = c$ (B) $x + \cot\left(\frac{x-y}{2}\right) = c$

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

Q.81 The general solution of differential equation $\frac{dy}{dx} = e^{\frac{x^2}{2}} + xy$ is

(A) $y = ce^{-\frac{x^2}{2}}$ (B) $y = ce^{\frac{x^2}{2}}$

(C) $y = (x + c)e^{\frac{x^2}{2}}$ (D) $y = (c - x)e^{\frac{x^2}{2}}$

Q.82 The differential equation $vdy + xdy = dy$ renresents

(A) A set of circles with center on x axis

(B) A set of circles with center on y-axis

(C) A set of ellipse

(D) A set of circles with center on y axis

Q.83 The general solution of $\frac{dy}{dx} = 2xe^{x^2-y}$ is

(A) $e^{x^2-y} = c$ (B) $e^{-y} + e^{x^2} = c$

(C) $e^{y} = e^{x^2} + c$ (D) $e^{x^2+y} = c$

Q.84 The solution of the equation $2xy' - y = 3$ represents a family of

(A) Circle (B) Straight line

(C) Ellipse (D) Parabola

Q.85 The solution of $y' - y = 1, y(0) = 1$, is given by $y(x) =$

(A) e^x (B) $-e^{-x}$

(C) 1 (D) $2e^x - 1$

Q.86 The solution of differential equation$(1 + x^2)\frac{dy}{dx} + y = e^{\tan^{-1} x}$ is

(A) $ye^{\tan^{-1} x} = \frac{1}{2}e^{2\tan^{-1} x} + c$ (B) $y = \frac{1}{2}e^{2\tan^{-1} x} + c$

(C) $ye^{\tan^{-1} x} = 2e^{2\tan^{-1} x} + c$ (D) $y \cdot \tan^{-1} x = \frac{1}{2}e^{2ta\ ^{-1} x} + c$

Q.87 The solution of differential equation$x^2y^2dy = (1 - xy^3)dx$ is

(A) $x^3y^3 = x^2 + c$ (B) $2x^3y^3 = 3x^2 + c$

(C) $x^3y^3 = x^2 + x + c$ (D) $x^3y^3 = 3x^2 + c$

Q.88 The solution of the differential equation$ydx + (x + x^2y)dy = 0$ is

(A) $\log y = cx$ (B) $-\frac{1}{xy} + \log y = c$

(C) $\frac{1}{xy} + \log y = c$ (D) $-\frac{1}{xy} = c$

Q.89 Solution of $ydx - xdy = x^2ydx$ is

(A) $y^2e^{x^2} = cx^2$ (B) $ye^{-x^2} = cx^2$

(C) $y''' + y'' + y = 0$ (D) $y' = y$

Q.90 Solution of differential equation $\frac{dy}{dx}\tan y = \sin(x + y) + \sin(x - y)$, is

(A) $\sec y + 2\cos x = c$ (B) $\sec y - 2\cos x = c$

(C) $\cos y - 2\sin x = c$ (D) $\tan y - 2\sec x = c$

EXERCISE LEVEL –II

EL– II

Q.1 Find the order & degree of following differential equations.

(1) $\frac{dy}{dx}+y=\frac{1}{\frac{dy}{dx}}$

(2) $\sin^{-1}\left(\frac{dy}{dx}\right)=x+y$

(3) $e^{\left(\frac{dy}{dx}-\frac{d^2y}{dx^3}\right)}=\text{In}\left(\frac{d^5y}{dx^5}+1\right)$

(4) $\left[\left(\frac{dy}{dx}\right)^{\frac{1}{2}}+y\right]^2=\frac{d^2y}{dx^2}$

Q.2 Derive a differential equation for the family of straight lines that pass through the origin.

Q.3 Derive the differential equation for all circles that touch the x-axis at the origin and have their centers on the y-axis.

Q.4 Derive the differential equation for the family of curves described by y = a sin bx + c, where a and c are arbitrary constants.

Q.5 Demonstrate that the differential equation for the system of parabolas y^2 = 4a x - b is provided by:

$$\frac{d^2y}{dx^2}+\left(\frac{dy}{dx}\right)^2=0$$

Q.6 Derive a differential equation for the family of parabolas with the focus at the origin and the axis of symmetry along the x-axis.

Q.7 Find the solution for the given differential equation:

(1) $x^2y\frac{dy}{dx}=(x+1)(y+1)$ (2) $\frac{dy}{dx}=e^{x+y}+x^2e^y$

(3) $xy\frac{dy}{dx}=1+x+y+xy$ (4) $\frac{dy}{dx}=1+e^{x-y}$

(5) $\frac{dy}{dx}=\sin(x+y)+\cos(x+y)$ (6) $\frac{dy}{dx}=x\tan(y-x)+1$

Q.8 Determine the solution for the differential equation: $(1+x)ydx=(y-1)xdy$

Q.9 Find $e^{\frac{dy}{dx}}=x+1$, given that when x = 0, y = 3

Q.10 Evaluate $\frac{dy}{dx}=(4x+y+1)^2$

Q.11 Solve $\sin^{-1}\left(\frac{dy}{dx}\right) = x + y$

Q.12 Find the solutions to the following differential equations:

(1) $\left(x\frac{dy}{dx} - y\right)\tan^{-1}\frac{y}{x} = x$ Given that $y = 0$ at $x = 1$

(2) $x\frac{dy}{dx} = y - x\tan\frac{y}{x}$

(3) $\frac{dy}{dx} = \frac{x+2y-3}{2x+y+3}$

(4) $\frac{dy}{dx} = \frac{x+y+1}{2x+2y+3}$

(5) $\frac{dy}{dx} = \frac{3x+2y-5}{3y-2x+5}$

Q.13 Find $x^2dy + y(x + y)\,dx = 0$

Q.14 Solve: $(x^2 - y^2)\,dx + 2xydy = 0$ given that $y = 1$ when $x = 1$

Q.15 Evaluate the differential equation $\frac{dy}{dx} = \frac{x+2y-5}{2x+y-4}$

Q.16 Solve $\frac{dy}{dx} = \frac{yf'(x) - y^2}{f(x)}$

Q.17 Evaluate $\frac{dy}{dx} = \frac{x-2y+5}{2x+y-1}$

Q.18 Find the solutions for the following differential equations:

(1) $x\left(x^2+1\right)\frac{dy}{dx} = y\left(1-x^2\right) + x^2 \text{In} x$

(2) $\left(x+2y^3\right)\frac{dy}{dx} = y$

(3) $x\frac{dy}{dx} + y = y^2 \text{In} x$

(4) $xy^2\left(\frac{dy}{dx}\right) - 2y^3 = 2x^3$ given $y = 1$ at $x = 1$

Q.19 Find $\frac{dy}{dx} + \frac{3x^2}{1+x^3}y = \frac{\sin^2 x}{1+x^3}$

Q.20 Solve: $x\,\text{In}\,x\frac{dy}{dx} + y = 2\,\text{In}\,x$

Q.21 Evaluate: $y\sin x\frac{dy}{dx} = \cos x\left(\sin x - y^2\right)$

Q.22 Solve: $\frac{dy}{dx} - \frac{y}{x} = \frac{y^2}{x^2}$

ANSWER KEY – LEVEL – I

Q.	1	2	3	4	5	6	7	8	9	10
Ans.	C	A	D	C	A	A	B	C	B	B
Q.	11	12	13	14	15	16	17	18	19	20
Ans.	A	B	C	B	A	B	C	C	A	C
Q.	21	22	23	24	25	26	27	28	29	30
Ans.	B	D	A	C	A	C	C	A	A	C
Q.	31	32	33	34	35	36	37	38	39	40
Ans.	C	A	D	C	B	C	C	B	C	C
Q.	41	42	43	44	45	46	47	48	49	50
Ans.	C	D	C	B	A	C	C	B	C	A
Q.	51	52	53	54	55	56	57	58	59	60
Ans.	B	C	A	D	C	D	A	A	D	D
Q.	61	62	63	64	65	66	67	68	69	70
Ans.	A	C	A	A	C	C	A	B	D	D
Q.	71	72	73	74	75	76	77	78	79	80
Ans.	C	D	A	C	C	D	A	C	B	B
Q.	81	82	83	84	85	86	87	88	89	90
Ans.	C	A	C	D	D	A	B	B	A	A