JEE Chapter 19 CD

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C. MCQ with one correct answer

1. A solution of the differential equation (1999 - 2 Marks)

$$\left(\frac{dy}{dx}\right)^2 - x\frac{dy}{dx} + y = 0 \text{ is}$$

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

2. If $x^2 + y^2 = 1$, then (2000S)

(a) $yy'' - 2(y')^2 + 1 = 0$ (b) $yy'' + (y')^2 + 1 = 0$
(b) $yy'' + (y')^2 - 1 = 0$ (d) $yy'' + 2(y')^2 + 1 = 0$

3. If $y(t)$ is a solution of $(1 + t)\frac{dy}{dt} - ty = 1$ and $y(0) = -1$, then (2003S)

$$y(1) \text{ is equal to}$$

(a) $-\frac{1}{2}$ (b) $e + \frac{1}{2}$
(b) $e - \frac{1}{2}$ (d) $\frac{1}{2}$

4. If $y = y(x)$ and $\frac{2+\sin x}{y+1}\left(\frac{dy}{dx}\right) = -\cos x$, $y(0) = 1$, then $y\left(\frac{\pi}{2}\right)$ (2004S)

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

5. If $y = y(x)$ and it follows the relation $x\cos y + y\cos x = \pi$ then $y''(0) =$ (2005S)

(a) 1 (b) -1
(b) $\pi - 1$ (d) $-\pi$

6. The solution of primitive integral equation $\left(x^2 + y^2\right)dy = xy\,dx$ is $y = y(x)$. If $y(1) = 1$ and $x_0 = e$, then x_0 is equal to (2005S)

(a) $\sqrt{2\left(e^2 - 1\right)}$ (b) $\sqrt{2\left(e^2 + 1\right)}$
(b) $\sqrt{3e}$ (d) $\sqrt{\frac{e^2+1}{2}}$

7. For the primitive integral equation $ydx + y^2dy = x\,dy$; $x \in \mathbb{R}, y > 0, y = y(x), y(1) = 1$, then $y(-3)$ is (2005S)

(a) 3 (b) 2
(b) 1 (d) 5

8. The differential equation $\frac{dy}{dx} = \frac{\sqrt{1-y^2}}{y}$ determines a family of circles with (2005S)

(a) variable radii and a fixed centre at $(0, 1)$
(b) variable radii and a fixed centre at $(0, -1)$
(c) fixed radius 1 and variable centres along the x-axis
(d) fixed radius 1 and variable centres along the y-axis

9. The function $y = f(x)$ is the solution of the differential equation

$$\frac{dy}{dx} + \frac{xy}{x^2 - 1} = \frac{x^4 + 2x}{\sqrt{1 - x^2}}$$

in $(-1, 1)$ satisfying $f(0) = 0$. Then

$$\int_{-\frac{\sqrt{3}}{2}}^{\frac{\sqrt{3}}{2}} f(x)\,dx \text{ is}$$

(a) $\frac{\pi}{3} - \frac{\sqrt{3}}{2}$ (b) $\frac{\pi}{3} - \frac{\sqrt{3}}{4}$
(b) $\frac{\pi}{6} - \frac{\sqrt{3}}{4}$ (d) $\frac{\pi}{6} - \frac{\sqrt{3}}{2}$

10. If $y = y(x)$ satisfies the differential equation

$$8\sqrt{x}\left(\sqrt{9 + \sqrt{x}}\right)dy = \left(\sqrt{4 + \sqrt{9 + \sqrt{x}}}\right)^{-1} dx,\ x > 0 \text{ and}$$

$$y(0) = \sqrt{7}, \text{ then } y(256) =$$

(a) 3 (b) 9
(b) 16 (d) 80

D. MCQ with one or more than correct answer

1. The order of the differential equation whose general solution is given by $y = (C_1 + C_2)\cos(x + C_3) - C_4e^{x+C_5}$, where C_1, C_2, C_3, C_4, C_5 are arbitrary constants, is (1998 - 2 Marks)

(a) 5 (b) 4
(b) 3 (d) 2

2. The differential equation representing the family of curves $y^2 = 2c\left(x + \sqrt{c}\right)$, where c is a positive parameter, is of (1999 - 3 Marks)

(a) order 1 (b)order 2
(b) degree 3 (d)degree 4

3. A curve $y = f(x)$ passes through $(1, 1)$ and at $P(x, y)$, the tangent cuts the x-axis and y-axis at A and B respectively such that $BP : AP = 3 : 1$, then

(a) equation of curve is $xy' - 3y = 0$
(b) normal at $(1, 1)$ is $x + 3y = 4$
(c) curve passes through $\left(2, \frac{1}{8}\right)$
(d) equation of curve is $xy' + 3y = 0$

4. If $y(x)$ satisfies the differential equation $y' - y\tan x = 2x\sec x$ and $y(0) = 0$, then

(a) $y\left(\frac{\pi}{4}\right) = \frac{\pi^2}{8\sqrt{2}}$ (b) $y\left(\frac{\pi}{4}\right) = \frac{\pi^2}{18}$
(b) $y\left(\frac{\pi}{3}\right) = \frac{\pi^2}{9}$ (d) $y\left(\frac{\pi}{3}\right) = \frac{4\pi}{3} + \frac{2\pi^2}{3\sqrt{3}}$

5. A curve passes through the point $\left(1, \frac{\pi}{6}\right)$. Let the slope of the curve at each point (x, y) be $\frac{y}{x} + \sec\left(\frac{y}{x}\right), x > 0$. Then the equation of the curve is

(a) $\sin\left(\frac{y}{x}\right) = \log x + \frac{1}{2}$ (b) $\cos\sec\left(\frac{y}{x}\right) = \log x + 2$
(b) $\sec\left(\frac{2y}{x}\right) = \log x + 2$ (d) $\cos\left(\frac{2y}{x}\right) = \log x + \frac{1}{2}$