One Two academy | Ordinary Differential Equations

Maximum Mark: 25 **Mathematics** **Time: 50 minutes**

Choose the correct answer: **3 x 1 = 3**

1. What is the sum of order and degree of the differential equation:

$$\left(1+\frac{d^2y}{dx^2}\right)^{\frac{2}{5}}=\frac{d^3y}{dx^3}$$

(a) 2 (b) 6 (c) 5 (d) 8

2. The integrating factor of the differential equation $\frac{dy}{dx}+y=\frac{1+y}{\lambda}$ is

(a) $\frac{x}{e^{\lambda}}$ (b) $\frac{e^{\lambda}}{x}$ (c) $\lambda\, e^{x}$ (d) e^{x}

3. If the solution of the differential equation $\frac{dy}{dx}=\frac{ax+3}{2y+f}$ represents a circle, then the value of a is

(a) 2 (b) -2 (c) 1 (d) -1

Answer the following: **3 x 2 = 6**

4. Assume that a spherical rain drop evaporates at a rate proportional to it's surface area. Form a differential equation involving the rate of change of the radius of the rain drop.

5. Find the value of m so that the function $y=e^{mx}$ is a solution of the given differential equation. $y''-5y'+6y=0$

6. The slope of the tangent to the curve at any point is the reciprocal of four times the ordinate at that point. The cure passes through (2,5). Find the equation of the curve.

Answer any two of the following: **2 x 3 = 6**

7. Solve the following Linear differential equation:

$$\left(y-e^{\sin^{-1}x}\right)\frac{dy}{dx}+\sqrt{1-x^2}=0.$$

8. The engine of a motor is moving at a rate 10 ms^{-1} is shut off. Given that the retardation at any subsequent time (after shutting off the engine) equal to the velocity at that time. Find the velocity after 2 second of switching off the engine.

9. Solve the following differential equation:

$$(ydx-xdy)\cot\left(\frac{x}{y}\right)=ny^2dx$$

Answer the following: **2 x 5 = 10**

10. Solve $x\,dy=\left(y+4x^5e^{x^4}\right)dx$.

OR

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Prove that y - $\tan^{-1}\left(\frac{x+y}{a}\right) = c$ is the solution for the differential equation $(x+y)^2 \frac{dy}{dx} = a^2$.

11. A tank contains 1000 litres of water in which 100 grams of salt is dissolved. Brine runs in a rate of 10 litres per minute, and each litres contains 5 grams of dissolved salt. The mixture of the tank is kept uniformly by stirring. Brine runs out at 10 litres per minute. Find the amount of salt at any time 't'.

All the Best

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Answer Key attached in the next page !!!

This page is to prevent seeing answer key

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Answer Key

Q.no	Solution	Marks
1.	(d) 8	**1**
2.	(b) $\frac{e^{\lambda}}{x}$	**1**
3.	(b) -2	**1**
4.	$\frac{dr}{dt} = -k$	**2**
5.	m = 2,3	**2**
6.	$2y^2 = x + 48$	**2**
7.	$\boldsymbol{ye^{sin^{-1}x} = \frac{e^{2\,sin^{-1}x}}{2} + c}$	**3**
8.	$v = \frac{10}{e^2}$	**3**
9.	$\sin\left(\frac{x}{y}\right) = e^{mx+c}$	**3**
10.	$\frac{y}{x} = e^{x^4} + c$ **OR** **Correct proof**	**5**
11.	$x = 2500 - 2400e^{-0.02t}$	**5**

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