Session: 2023-24   **Semester:** II   **Section:** All

Course Code: BAS203   **Course Name:** Engineering. Mathematics II

UNIT-I: Ordinary Differential Equation of Higher Order

Tutorial 2

S.No.	KL, CO	Question
1	K3, CO1	(i) Determine the differential equation whose set of independent solutions are $\{1, x, x^2\}$ **(AKTU-2017)** (ii) Find the degree and order of the differential equation $$\frac{d^2y}{dx^2} + \sqrt{1 + \left(\frac{dy}{dx}\right)^3} = 0$$
2	K3, CO1	Solve $(D^2 - 3D + 2)y = x^2 + 2x + 1$ **(AKTU-2015,2016)**
3	K3, CO1	Solve $(D^2 + 2D + 1)y = x^2 e^{-x} \cos x$
4	K3, CO1	Solve $(D^2 - 2D + 4)y = e^x \cos x + \sin x \cos 3x$ **(AKTU-2018)**
5	K3, CO1	Solve $\frac{d^2y}{dx^2} + y = cosec x$ **(AKTU-2022)**
6	K3, CO1	Solve $\frac{dx}{dt} + \frac{dy}{dt} - 2y = 2\cos t - 7\sin t$ $\frac{dx}{dt} - \frac{dy}{dt} + 2x = 4\cos t - 3\sin t$ **(AKTU-2011)**
7	K3, CO1	Solve $x^2 \frac{d^2y}{dx^2} + x\frac{dy}{dx} - y = x^3 e^x$ **(AKTU-2016)**
8	K3, CO1	Solve by variation of parameter $(D^2 - 1)y = 2(1 - e^{-2x})^{-1/2}$ **(AKTU-2021)**
9	K3, CO1	Solve by changing the independent variable $x \frac{d^2y}{dx^2} - \frac{dy}{dx} - 4x^3 y = 8x^3 \sin x^2$ **(AKTU-2022)**
10	K4, CO1	The differential equation for a circuit in which self-inductance and capacitance neutralize each other is $L\frac{d^2i}{dt^2} + \frac{i}{C} = 0$. Find the current i as a function of t, given that I is the maximum current and *i=0* when *t=0*

Answers

1. (i) $(D-1)^3 y = 0$,   (ii) Order-2, Degree-2

2. $y = C_1 e^x + C_2 e^{2x} + 1/2\left(x^2 + 5x + \frac{15}{2}\right)$

3. $y = (c_1 + c_2 x)e^{-x} + e^{-x}(-x^2 \cos x + 4x \sin x + 6\cos x)$.

4. $y = e^x(c_1 \cos\sqrt{3}x + c_2 \sin\sqrt{3} + (e^x \cos x)\frac{1}{2} - \left(\frac{1}{8}\right)\cos 2x + 1/104(2\cos 4x - 3\sin 4x)$

5. $y = c_1 \cos x + c_2 \sin x + \sin x \log \sin x - x \cos x$

6. $x = c_1 \cosh\sqrt{2}\,t + c_2 \sinh\sqrt{2}\,t + 3\cos t, \; y = c_3 \cosh\sqrt{2}\,t + c_4 \sinh\sqrt{2}\,t + 2\sin t$

7. $y = c_1 x + c_2 x^{-1} + \left(x - 3 + \frac{3}{x}\right)e^x$

8. $y = c_1 e^x + c_2 e^{-x} - e^x \sin^{-1}(e^{-x}) - e^{-x}(e^{2x} - 1)^{1/2}$

9. $y = c_1 e^{x^2} + c_2 e^{-x^2} - \sin x^2$

10. $i = I\frac{\sin t}{\sqrt{LC}}$