Tutorial Sheet No. 02

Course: B.Tech. (CSE, IT, ECE, EEE, ME, CE, FT)

Year & Semester: I / II

Subject & Code: Mathematics – II (BAS – 203)

Unit & Topic: I / ODE's of Higher Order (b)

Prepared By: Dr. Manoj Kumar Gupta, Assistant Professor

1. Solve the following differential equations:

(a) $x^2\frac{d^2y}{dx^2}+4x\frac{dy}{dx}+2y=e^x$. [Ans.: $y=\frac{C_1}{x}+\frac{C_2}{x^2}+\frac{1}{x^2}e^x$]

(b) $x^3y'''+2x^2y''+2y=10\left(x+\frac{1}{x}\right)$.

[Ans.: $y=\frac{C_1}{x}+xC_2\cos(\log_e x)+xC_3\sin(\log_e x)+5x+\frac{2}{x}\log_e x$]

(c) $x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}+2y=\sin(\log_e x^2)$.

[Ans.: $y=C_1\cos\left(\sqrt{2}\log_e x\right)+C_2\sin\left(\sqrt{2}\log_e x\right)-\frac{1}{2}\sin\left(\log_e x^2\right)$]

2. Solve the following differential equations by variation of parameter:

(a) $y''+9y=\sec 3x$

(b) $\frac{d^2y}{dx^2}+4y=4\sec^2 2x$ [Ans.: $C_1\cos 2x+C_2\sin 2x-1+\sin 2x\,.\log(\sec 2x+\tan 2x)$]

3. Solve the following system of simultaneous linear differential equations:

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

[Ans.: $x=e^{3t}\left(C_1\cosh\sqrt{10}t+C_2\sinh\sqrt{10}t\right)$ and $y=\frac{\sqrt{10}}{2}e^{3t}\left(C_1\sinh\sqrt{10}t+C_2\cosh\sqrt{10}t\right)$]

(b) $\frac{dx}{dt}+\frac{dy}{dt}+3x=\sin t$ and $\frac{dx}{dt}+y-x=\cos t$

[Ans.: $x=C_1e^{-t}+C_2e^{3t}-\frac{1}{5}(\cos t-2\sin t)$ and $y=2C_1e^{-t}-2C_2e^{3t}+\frac{2}{5}\cos t+\frac{1}{5}\sin t$]