Assignment 1

Department of Physics, Mugberia Gangadhar Mahavidyalaya , 2022

1. Write down the auxiliary equations and find its root of the following differential equations:

(a) $\frac{d^2y}{dx^2} + \frac{dy}{dx} + y = 0,$ (b) $2\frac{d^2y}{dx^2} + 7\frac{dy}{dx} - 3y = 0$

(c) $4\frac{d^2y}{dx^2} + 7y = 0,$ (d) $\frac{d^2y}{dx^2} + \frac{dy}{dx} = 0$

2. Obtain the general solutions, that is, the complementary functions, of the following equations:

(a) $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = 0$ (b) $\frac{d^2y}{dx^2} + 7\frac{dy}{dx} + 6y = 0$ (c) $\frac{d^2x}{dt^2} + 5\frac{dx}{dt} + 6x = 0$

(d) $\frac{d^2y}{dt^2} + 2\frac{dy}{dt} + y = 0$ (e) $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = 0$ (f) $\frac{d^2y}{dt^2} + \frac{dy}{dt} + 8y = 0$

(g) $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = 0$ (h) $\frac{d^2y}{dt^2} + \frac{dy}{dt} + 5y = 0$ (i) $\frac{d^2y}{dx^2} + \frac{dy}{dx} - 2y = 0$

(j) $\frac{d^2y}{dx^2} + 9y = 0$ (k) $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} = 0$ (l) $\frac{d^2x}{dt^2} - 16x = 0$

3. Find a particular integral for the equation $\frac{d^2x}{dt^2} - x = 4e^{-2t}$

4. Obtain the general solution of $y'' - y' - 2y = 6$

5. Obtain the general solution of the equation $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = 10\cos 2x$

   Find the particular solution satisfying $y(0) = 1,\ \frac{dy}{dx}(0) = 0$

6. Find a particular integral for the equation $\frac{d^2y}{dx^2} + \frac{dy}{dx} + y = 1 + x$

7. Find the general solution of

(a) $\frac{d^2x}{dt^2} - 6\frac{dx}{dt} + 5x = 3$ (b) $\frac{d^2x}{dt^2} - 2\frac{dx}{dt} + x = e^t$