Assignment 6

1. Solve the following quadratic equation:

   \[ ax^2 + bx + c = 0 \]

2. Construct the following block diagrams:

   ![Block Diagram 1](image1)
   ![Block Diagram 2](image2)

3. Given a circuit with the following parameters:

   - Resistance: R = 10 Ω
   - Voltage: V = 20 V
   - Current: I = 2 A

   Calculate the Power (P = V * I) and Efficiency (η = P / V)

4. Construct the following block diagrams:

   ![Block Diagram 3](image3)
   ![Block Diagram 4](image4)

5. Given a differential equation:

   \[ \frac{d^2y}{dx^2} + 4y = 0 \]

   Solve the equation using the method of undetermined coefficients.

6. Construct the following block diagrams:

   ![Block Diagram 5](image5)
   ![Block Diagram 6](image6)

7. Given a system with the following transfer function:

   \[ H(s) = \frac{1}{s^2 + 2s + 1} \]

   Find the step response and the impulse response.

8. Construct the following block diagrams:

   ![Block Diagram 7](image7)
   ![Block Diagram 8](image8)

9. Given a system described by the following state equation:

   \[ \dot{x} = Ax + Bu \]

   where

   - \( A = \begin{bmatrix} 0 & 1 \\ -1 & -2 \end{bmatrix} \)
   - \( B = \begin{bmatrix} 0 \\ 1 \end{bmatrix} \)
   - \( u = 1 \)

   Find the state transition matrix \( e^{At} \) and the state response \( x(t) \).

10. Construct the following block diagrams:

    ![Block Diagram 9](image9)