

# MECH 6300-HW3

i)  $\lambda$

$$A = \begin{bmatrix} 1 & 0 & 0 \\ 10 & 2 & 0 \\ 0 & 5 & 4 \end{bmatrix} \quad J = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 4 \end{bmatrix}$$

$\lambda_1 = 1$   
 $\lambda_2 = 2$   
 $\lambda_3 = 4$

ii) Jordan Form Method:

$$e^{Jt} = \begin{bmatrix} e^t & 0 & 0 \\ 0 & e^{2t} & 0 \\ 0 & 0 & e^{4t} \end{bmatrix}$$

$$A = QJQ^{-1}$$

$$e^{At} = Q e^{Jt} Q^{-1}$$

$$e^{At} = \begin{bmatrix} \frac{1}{10} & 0 & 0 \\ -1 & 1 & 0 \\ \frac{5}{3} & -\frac{5}{2} & 1 \end{bmatrix} \begin{bmatrix} e^t & 0 & 0 \\ 0 & e^{2t} & 0 \\ 0 & 0 & e^{4t} \end{bmatrix} \begin{bmatrix} 10 & 0 & 0 \\ 10 & 1 & 0 \\ \frac{25}{3} & \frac{5}{2} & 1 \end{bmatrix}$$

$$e^{At} = \begin{bmatrix} e^t & 0 & 0 \\ -10e^t + 10e^{2t} & e^{2t} & 0 \\ \frac{50}{3}e^t - 25e^{2t} + \frac{25}{3}e^{4t} & -\frac{5}{2}e^{2t} + \frac{5}{2}e^{4t} & e^{4t} \end{bmatrix}$$