Exam 2 Equation Sheet

$$t_i = \sigma_{ij} n_j \tag{1}$$

$$\rho a_i = T_{ij,j} + \rho B_i \tag{2}$$

$$\rho_0 \ddot{u}_i = \rho_0 B_i + (\lambda + \mu) e_{,i} + \mu u_{i,jj} \tag{3}$$

$$T^0_{ij} = J T_{im} F^{-1}_{jm} \tag{4}$$

$$\tilde{T}_{ij} = J F^{-1}_{ik} T_{km} F^{-1}_{jm} \tag{5}$$

$$T_{ij} = \lambda E_{kk} \delta_{ij} + 2\mu E_{ij} \tag{6}$$

$$\nabla^2 (T_{11} + T_{22}) = -\frac{4\rho}{1+\kappa}(b_{1,1} + b_{2,2}) \tag{7}$$

$$\kappa = \begin{cases} 3 - 4\nu & \text{Plane Strain} \\ \frac{3-\nu}{1+\nu} & \text{Plane Stress} \end{cases} \tag{8}$$

$$E_{ij} = \frac{1}{2}(u_{i,j} + u_{j,i}) \tag{9}$$

$$T_{11} = \frac{\partial^2 \varphi}{\partial x_2^2} + \mathcal{V} \tag{10}$$

$$T_{12} = -\frac{\partial^2 \varphi}{\partial x_1 \partial x_2} \tag{11}$$

$$T_{22} = \frac{\partial^2 \varphi}{\partial x_1^2} + \mathcal{V} \tag{12}$$

$$T_{rr} = \frac{1}{r}\frac{\partial \varphi}{\partial r} + \frac{1}{r^2}\frac{\partial^2 \varphi}{\partial \theta^2} + \mathcal{V} \tag{13}$$

$$T_{r\theta} = -\frac{\partial}{\partial r}\left(\frac{1}{r}\frac{\partial \varphi}{\partial \theta}\right) \tag{14}$$

$$T_{\theta\theta} = \frac{\partial^2 \varphi}{\partial r^2} + \mathcal{V} \tag{15}$$

$$a^*_i = Q_{ij}(t) a_i \tag{16}$$

$$T^*_{ij} = Q_{ik}(t) T_{kl} Q_{jl}(t) \tag{17}$$

$$\mathring{T}_{ij} = \frac{D}{Dt} T_{ij} + T_{ik} W_{kj} - W_{ik} T_{kj} \tag{18}$$

$$\begin{bmatrix} E_{11} \\ E_{22} \\ E_{33} \\ 2E_{23} \\ 2E_{13} \\ 2E_{12} \end{bmatrix} = \begin{bmatrix} S_{1111} & S_{1122} & S_{1133} & S_{1123} & 0 & 0 \\ S_{1122} & S_{2222} & S_{2233} & S_{2223} & 0 & 0 \\ S_{1133} & S_{2233} & S_{3333} & S_{2333} & 0 & 0 \\ S_{1123} & S_{2223} & S_{2333} & S_{2323} & 0 & 0 \\ 0 & 0 & 0 & 0 & S_{1313} & S_{1213} \\ 0 & 0 & 0 & 0 & S_{1213} & S_{1212} \end{bmatrix} \begin{bmatrix} T_{11} \\ T_{22} \\ T_{33} \\ T_{23} \\ T_{13} \\ T_{12} \end{bmatrix} \tag{19}$$