- Then (13) and ① – ② directly give the <u>primal mixed formulation</u> (PMF):

$$(14) \quad \boxed{\begin{array}{lll} (D^{-1}\sigma, \tau)_0 - (\varepsilon(u), \tau)_0 = 0 & & \forall \tau \in X \\ -(\sigma, \varepsilon(v))_0 & = -(f, v)_0 - \int_{\Gamma_t} t^T \cdot v \, ds & \forall v \in \Lambda \end{array}}$$

- <u>We obviously have the following relationships:</u>

$$\left.\begin{array}{l} \text{PVF } (2) \Longrightarrow \text{PMF } (14) \\ \text{PMF } (14) \Longrightarrow \text{PVF } (2) \end{array}\right\} \Longrightarrow \begin{array}{c} (2) \equiv (14) \\ \exists! \Rightarrow \exists! \end{array}$$

Theorem 3.7

- <u>The PMF (14) can be written as abstract MVP:</u>

→ see also Chapter 2 !

Find $(\sigma, u) \in X \times \Lambda$:

$$a(\sigma, \tau) + b(\tau, u) = \langle F, \tau \rangle \quad \forall \tau \in X$$

$$b(\sigma, v) = \langle G, v \rangle \quad \forall v \in \Lambda$$

where

$X = \{\sigma = [\sigma_{ij}] : \sigma_{ij} \in L_2(\Omega) : \sigma_{ij} = \sigma_{ji}\} = L_2^{sym}(\Omega)$

$\Lambda = \{v = [v_i] : v_i \in H^1(\Omega) : v = 0 \text{ on } \Gamma_u\} = H_0^1(\Omega)$

$a(\sigma, \tau) = (D^{-1}\sigma, \tau)_0$, $b(\tau, u) = (\varepsilon(u), \tau)_0$,

$\langle F, \tau \rangle = 0$, i.e. $F = 0 \in X^*$ given,

$\langle G, v \rangle = -\int_\Omega f^T v \, dx - \int_{\Gamma_t} t^T v \, ds$, i.e. $G \in \Lambda^*$ given.