HOMEWORK I

44 – 7 PAGES

(1) SIMPLIFY THE FOLLOWING EXPRESSIONS:

(a) $\delta_{1k}\,\delta_{k1}$ (b) $\delta_{1k}\,\delta_{2k}$ (c) δ_{jj} (d) $\delta_{ij}\,\delta_{jl}$

(e) $\delta_{ij}\,\delta_{ji}$ (f) $\delta_{ij}\,\delta_{kl}\,\delta_{ik}$ (g) $\delta_{ij}\,\delta_{kl}\,\delta_{ik}\,\delta_{jl}$

(2) WRITE EXPLICIT EXPRESSIONS FOR S_{11}, S_{12} AND S_{23} FOR EACH ONE OF THE FOLLOWING:

(a) $S_{ij} = \sigma_{ij} - \frac{1}{3}\,\sigma_{kk}\,\delta_{ij}$ (b) $S_{ij} = p_{ik}\,p_{jk}\,p_{nn}$

(3) IN CLASS WE SHOWED THAT FOR ANY VECTOR $\underline{v}$ THE FOLLOWING HOLDS: $\underline{v} = (\underline{v} \cdot \underline{e}_i)\,\underline{e}_i$. ON THE BASIS OF THIS EXPRESSION, SHOW THAT (a) $\underline{e}'_j = R_{ji}\,\underline{e}_i$ AND (b) $\underline{e}_i = R_{ji}\,\underline{e}'_j$, WHERE $R_{ji} = (\underline{e}'_j \cdot \underline{e}_i)$ AS USUAL.

(4) SHOW THAT THE MODULUS OF A VECTOR $\underline{v}$ IS AN <u>INVARIANT</u>, i.e., THAT $\sqrt{v_i v_i} = \sqrt{v'_j v'_j}$. NOTE: v_i AND v'_j ARE THE COMPONENTS OF $\underline{v}$ IN TWO DIFFERENT CARTESIAN SYSTEMS, $\underline{v} = v_i\,\underline{e}_i = v'_j\,\underline{e}'_j$ —

(5) SHOW THAT FOR A SECOND-ORDER TENSOR $\underline{T}$ THE QUANTITY T_{ii} IS AN INVARIANT, i.e., THAT $T_{ii} = T'_{jj}$.

NOTE: THIS IMPORTANT SCALAR QUANTITY IS COMMONLY CALLED THE <u>TRACE</u> OF