

CHAPTER 2, PART A

2.1 Given

$$[S_{ij}] = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 1 & 2 \\ 3 & 0 & 3 \end{bmatrix} \text{ and } [a_i] = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$$

Evaluate (a) S_{ii} , (b) $S_{ij}S_{ij}$, (c) $S_{ji}S_{ji}$, (d) $S_{jk}S_{kj}$, (e) $a_m a_m$, (f) $S_{mm}a_m a_m$, (g) $S_{mm}a_m a_m$.

Ans. (a) $S_{ii} = S_{11} + S_{22} + S_{33} = 1 + 1 + 3 = 5$.

(b) $S_{ij}S_{ij} = S_{11}^2 + S_{12}^2 + S_{13}^2 + S_{21}^2 + S_{22}^2 + S_{23}^2 + S_{31}^2 + S_{32}^2 + S_{33}^2 =$
 $1 + 0 + 4 + 0 + 1 + 4 + 9 + 0 + 9 = 28$.

(c) $S_{ji}S_{ji} = S_{ij}S_{ij} = 28$.

(d) $S_{jk}S_{kj} = S_{1k}S_{k1} + S_{2k}S_{k2} + S_{3k}S_{k3}$
 $= S_{11}S_{11} + S_{12}S_{21} + S_{13}S_{31} + S_{21}S_{12} + S_{22}S_{22} + S_{23}S_{32} + S_{31}S_{13} + S_{32}S_{23} + S_{33}S_{33}$
 $= (1)(1) + (0)(0) + (2)(3) + (0)(0) + (1)(1) + (2)(0) + (3)(2) + (0)(2) + (3)(3) = 23$.

(e) $a_m a_m = a_1^2 + a_2^2 + a_3^2 = 1 + 4 + 9 = 14$.

(f) $S_{mm}a_m a_m = S_{1m}a_m a_m + S_{2m}a_m a_m + S_{3m}a_m a_m =$
 $S_{11}a_1 a_1 + S_{12}a_1 a_2 + S_{13}a_1 a_3 + S_{21}a_2 a_1 + S_{22}a_2 a_2 + S_{23}a_2 a_3 + S_{31}a_3 a_1 + S_{32}a_3 a_2 + S_{33}a_3 a_3$
 $= (1)(1)(1) + (0)(1)(2) + (2)(1)(3) + (0)(2)(1) + (1)(2)(2) + (2)(2)(3) + (3)(3)(1)$
 $+ (0)(3)(2) + (3)(3)(3) = 1 + 0 + 6 + 0 + 4 + 12 + 9 + 0 + 27 = 59$.

(g) $S_{mm}a_m a_m = S_{mm}a_m a_m = 59$.

2.2 Determine which of these equations have an identical meaning with $a_i = Q_{ij}a'_j$.

(a) $a_p = Q_{pm}a'_m$, (b) $a_p = Q_{qp}a'_q$, (c) $a_m = a'_m Q_{mm}$.

Ans. (a) and (c)

2.3 Given the following matrices

$$[a_i] = \begin{bmatrix} 1 \\ 0 \\ 2 \end{bmatrix}, [B_{ij}] = \begin{bmatrix} 2 & 3 & 0 \\ 0 & 5 & 1 \\ 0 & 2 & 1 \end{bmatrix}$$

Demonstrate the equivalence of the subscripted equations and corresponding matrix equations in the following two problems.

(a) $b_i = B_{ij}a_j$ and $[b] = [B][a]$, (b) $s = B_{ij}a_i a_j$ and $s = [a]^T [B][a]$

Ans. (a)

$b_1 = B_{ij}a_j \rightarrow b_1 = B_{1j}a_j = B_{11}a_1 + B_{12}a_2 + B_{13}a_3 = (2)(1) + (3)(0) + (0)(2) = 2$

$b_2 = B_{2j}a_j = B_{21}a_1 + B_{22}a_2 + B_{23}a_3 = 2, \quad b_3 = B_{3j}a_j = B_{31}a_1 + B_{32}a_2 + B_{33}a_3 = 2$.

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Anthony S. Fauci



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British Books in Print ,1985 Books in Series ,1985 Vols for 1980 issued in three parts Series Authors and Titles

Scientific and Technical Books and Serials in Print ,1984 *Biomechanics of Diarthrodial Joints* Van C.

Mow,Anthony Ratcliffe,Savio L-Y. Woo,2012-12-06 Historical folklore indicates that Asklepios circa 900 BC the first western doctor of ancient Greece treated many patients with rheumatic diseases of 1 joints 2 Later Hippocrates circa 400 BC who claimed to have learned from Asklepios used the term arthritis in reference to joint diseases When the disease of arthritis strikes acute inflammation and pain attacks the joints of the body Indeed arthritic joint disease dates much farther back into antiquity than Asklepios Many modern anthropologists have noted degenerative joint disease in the fossils of Neanderthal man archanthropus europeus petraloniensis and even in those of dinosaurs More recent scientific studies on joints date back to the work of the great English anatomist Hunter who wrote The Structure and Diseases of Articular Cartilage in the Philosophical Transactions of London in 1743 The notion that osteoarthritis results from the wearing away of cartilage was copiously documented by the histological observations of the German physician Ecker in 1843 This idea was further supported by Pommer 1927 who felt that mechanical stresses played important roles in the initiation and propagation of cartilage lesions leading to osteoarthritis This same conclusion was reached by the assembled distinguished experts at a National Institutes of Health Workshop 3 held in 1986 **Solutions Manual for Continuum Mechanics and Plasticity**

Wu/Han-Chin,2006-09-01 **Scientific and Technical Books in Print** ,1972 **Introduction to Continuum**

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