Consider the number of r-valent labeled graphs with n vertices, where multiple edges and loops are allowed. Any such graph can be represented as follows.

First, label the vertices $1, ..., n$, where as shown below, nr must be even.. Let (l_{ij}) be a square matrix defined as follows. Let $l_{ii} = h$ if vertex i has h loops, 0 otherwise. For $i < j$, let l_{ij} be the number of edges connecting vertices i and j. For $i > j$, $l_{ij} = 0$. This is an upper-triangular matrix (including the diagonal). Now, for any i consider the sum

$$\sum_{j=1}^{n}(l_{ji} + l_{ij}) \tag{1}$$

This is the sum of the elements of l over row i plus the sum over column i. For any i, the sum over j of l_{ji} is the number of edges connecting vertex i to a vertex of equal or lower position. For any i, the sum over j of l_{ij} is the number of edges connecting vertex i to a vertex of equal or higher position. If there are loops at vertex i, the number of loops is counted in each sum. So the full sum is the number of edges connected with vertex i, counting the number of loops at vertex i twice, once for each end. This sum is r for all i since the graph is r-valent. Note that

$$\sum_{i=1}^{n}\sum_{j=1}^{n}(l_{ji} + l_{ij}) = 2\sum_{i=1}^{n}\sum_{j=1}^{n} l_{ij} \tag{2}$$

That is, this is an even number. But the sum is also nr, so that only even values of nr are possible for such graphs, and at least one of n and r must be even.

A central moment of the multivariate normal distribution with exponent r for all components is $E[X_1^r \cdots X_n^r \mid \mu = 0, \Sigma]$. From Phillips (2010), even moments, in this case those with even values of nr, can be represented symbolically with the set of upper-triangular, positive integer matrices l which satisfy

$$\sum_{j=1}^{n}(l_{ji} + l_{ij}) = r \tag{3}$$

This set of matrices is the same as the set of matrices just defined for r-valent labeled graphs with n vertices, so for even nr, the numbers of moment representations and the numbers of such graphs are equal.