On a Generating Function and its Probability Distributions. A Contribution to the Theory of Transition Rates II

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A previous theory of integer-valued probability distributions is extended to many dimensions, to develop a really systematic way of treating mode mixing. The mixing of the vibrational components arises through the rotation of the normal coordinates and consequently by mixing of the parameter components in consequence of a linear relationship. The multidimensional distribution (MD), is derived with the aid of a $2N$-dimensional generating function (GF), which is holomorphic in a polydisc $D^{2N}(0,1)$, and the expansion of which in a multiple power series leads to coefficients, which are values of a MD for several occupation number sets $(n_1,n_2,\ldots,n_N)$ or $(m_1,m_2,\ldots,m_N)$. Symmetry or invariance properties of the MD in respect to the exchange of parameters and the exchange of the occupation number sets $(n_1,n_2,\ldots,n_N)$ and $(m_1,m_2,\ldots,m_N)$ are investigated. For the special case, if the mixing matrix is a unit matrix, the multidimensional GF reduces to a product of one-dimensional GFs, each of which depends on parameters and complex variables of one separate component only. The advantages and disadvantages of this separation will be discussed. For illustrative purpose, relief plots of the MD are presented, demonstrating the effect of mode mixing.

Key words: Generating Function; Function of Several Complex Variables;
Multidimensional Probability Distributions; Transition Probabilities.