

Estimation of Probabilistic Distribution Function for the Responses of Linear Systems

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Probabilistic distributions of responses in the linear systems are estimated by the second-order third-moment method. Three probabilistic moments (mean, standard deviation and skewness) of responses are estimated from the known distributions of random variables using the second-order Taylor approximations. For an assumed type of probabilistic distribution function (PDF) of responses, the model parameters are derived by the method of moment estimation. Using the derived PDF, reliability analyses are performed for a given criterion. The efficiency of the proposed method is demonstrated in the cantilever beam problem. Estimated probabilistic moments of displacements and bending moments are compared with the results of Monte-Carlo simulation (MCS) and the derived probability of failure is compared with those of MCS and first-order reliability method (FORM).