Stat 121 (Mathematical Statistics I)

Problem Set No. 7

Instruction: Answer the following as indicated.

1. Derive the moment generating function of the $Gamma(\alpha, \beta)$ distribution.
2. Derive the variance of the $Beta(\alpha, \beta)$ distribution.
3. A production plant produces items that have a probability X of being defective. The plant manager does not know X, but from past experience she expects this probability to be equal to 4%. Furthermore, she quantifies her uncertainty about X by attaching a standard deviation of 2% to her 4% estimate. After consulting with an expert in statistics, the manager decides to use a Beta distribution to model her uncertainty about X. How should she set the two parameters of the distribution in order to match her priors about the expected value and the standard deviation of X?