Homework 4

Problem 1 (*15 points*) Virginia Air Conditioner Inc. (VAC) produces air conditioners for sale in the US market. Based on historical data, the summer demand for the air conditioners is given below:

Demand	100	150	200	250	300
Probability	0.05	0.25	0.3	0.24	0.16
Cumu. Prob.	0.05	0.30	0.60	0.84	1.00

An important component in each air conditioner is a compressor. VAC buys its compressors from an international supplier in Cleveland at a price of $150. Because the supplier's production lead time is long, VAC buys the compressors before summer and does not have a second opportunity to buy more during summer.

VAC uses a make-to-assemble production system, in which it assembles an air conditioner only when demanded. The labor and material costs of assembling a conditioner, in addition to the compressor, is $150. Thus, the VAC's total production cost of a conditioner is $300, which is the total of $150 for the compressor and $150 for labor and material. The selling price of an air conditioner is $450.

If VAC has leftover compressors at the end of October, it gives them away at zero price. If air conditioner demand exceeds the number of compressors VAC has in stock, the customers will go elsewhere.

The supplier's production cost of the compressor is $50.

1. (*3 points*) How many compressors should VAC order before summer?
2. (*3 points*) Under the order quantity from part 1, what are the expected profits of VAC, of the supplier, and of the supplier chain as a whole?
3. (*4 points*) Suppose that now the supplier offers to buy any unused compressors back from VAC at a price of $75. How many compressors should VAC order before summer?
4. (*4 points*) Under the buyback contract and the order quantity from part 3, what are the expected profits of VAC, of the supplier, and of the supplier chain as whole?
5. (*1 point*) Based on your answers in parts 2 and 4, would you recommend using such a buyback contract?