The exercise is not very specific about where the decision whether to market test or not should be placed in the decision graph. We put it after the product development, and so after a successful product development. (Alternatively, it could have been placed before the product development.) We assume there is a cost of 50 ($50,000) for the marketing test. A cost is subtracted from the ultimate payoff. We label a positive outcome of the test by \( I \) and a negative test by \( J \). The probability of \( I \) is \( r = P(I) \), which must be calculated from the other information. We also include a choice for market testing or no market testing, \( T \) or \( NT \). We put costs on certain edges. A cost of 50 for \( T \), a cost of 150 for high product development (Hi), a cost of 10 for low product development (Lo), The payoffs, before subtracting the costs for product development or testing is given at the terminal nodes. We use those given in class rather than the ones in the book; this allows us to combine the two paths at node \( C \) giving a simpler decision graph rather than a decision tree. The nodes \( A, K, C_1, D, D_1, \) and \( D_2 \) are owned by “nature” with probabilistic choices coming out. From \( A \), the probability of \( S \) (success) is \( p \) and of \( F \) (failure) is \( 1 - p \). From \( K \), the probability of \( S \) (success) is \( q \) and of \( F \) (failure) is \( 1 - q \). From \( D \) the probability of \( G \) (good reception) is \( s = P(G) \) and of \( B \) (bad reception) is \( 1 - s = P(B) \). From \( D_1 \) the probability of \( G \) (good reception) is \( s' = P(G \mid I) \) and of \( B \) (bad reception) is \( 1 - s' = P(B \mid I) \). From \( D_2 \) the probability of \( G \) (good reception) is \( s'' = P(G \mid J) \) and of \( B \) (bad reception) is \( 1 - s'' = P(B \mid J) \). The decision graph is given in the figure below.

Answer the following questions assuming that \( s = P(G) = 0.6 \) and \( 1 - s = P(B) = 0.4 \).

(a) The book solves for \( s' = P(G \mid I) = 0.87 \) in Example 3.14. Solve for \( s'' = P(G \mid J) \).

(b) Solve for \( r = P(I) \) using the formula \( P(I) = P(I \mid G) P(G) + P(I \mid B) P(B) \). Also note \( 1 - r = P(J) \). (This is not a branch on the decision graph, but is a consistency of the probabilities.)

(c) Solve for the expected payoff of the subtrees starting at \( C_0 \) (NT) and \( C_1 \) (T). Which is a better choice at \( C \)?

(d) Assuming that \( p = 0.9 \) and \( q = 0.5 \), solve for the expected payoff at \( A \) (Hi) and \( K \) (Lo). What is the best choice at \( X \)?