Assignment 3 – Part 2

Q4) Expectimax

1) Expectimax agent outperforms AlphaBetaAgent in this case as Pacman chooses its next steps assuming an expected behavior of the minimizing agent and not the worst-case scenario. This is especially useful when the ghost is a random agent and not an adversarial one.

For example, if a ghost is two steps away from Pacman and there is a food pellet between them, the worst case would assume that the ghost would immediately move towards Pacman, and using AlphaBetaAgent, Pacman would immediately move away. However, with Expectimax, a random ghost is 25% more likely to move towards Pacman and 75% more likely to move away. Thus, Pacman would try to get the food pellet.

2) **a) True.** The minimax policy always assumes the worst case for the min node i.e. assumes that the opposing agent will make the smartest choice (which minimizes its payoff) among the available options. So, v_M is a conservative number for the max node. On the other hand, v_E reflects what the opposing agent does on average (or probabilistically). It is a more realistic estimate, thus, would always be equal or higher than the worst-case scenario estimate.

b) True. Applying the optimal minimax policy to a game with chance nodes means disregarding the probabilities associated with each of the options that min node has. This effectively turns into a minmax tree, where it is assumed that the min node will always minimize its payoff i.e. the smallest value among its children is selected for the min node. As the max node is still selecting the highest value among its options, this will result in a payoff of at least v_M

c) False. We are not guaranteed a payoff of at least v_E as the expectimax value will take into account the probabilistic behavior of the min agent, thus will always give a higher or equal value to the one computed using optimal minimax i.e. v_M