1.

1)The annual fee is equivalent to 2% fixed management fee plus floating fee based as 20% of the excess return. The floating fee is equivalent to holding 0.2 call option on the fund. Using BSM equation, the call option worth 8.27%, so the total fee structure is equivalent to 2% +20%\*8.27% = 3.654%. With AUM $100,000, this fee is equivalent to $3,654.

The calculation is irrelevant to alpha, so if the alpha is 8% the result won’t change. If the standard deviation increases to 30%, the call option worth 11.14% and the performance fee is equivalent to 4.228%. With AUM $100,000, this fee is equivalent to $4,228.

ii) The $3000 maximum performance fee implies $15,000(15%) excess return. As a result, as soon as the manager achieves that threshold, he will invest all in risk-free asset to make sure he can receive the cap fee.

iii) There is ambiguity in the question, and I assume the paragraph “Let’s assume now that you ask the hedge fund manager to benchmark…” is part of the description in question iv) instead of question iii)

Now the strike price of the equivalent option is e(0.05), and the option worths 6.13%. To maintain the same equivalent value, we need to solve 2% + k \* 6.13%, and k = 27% as a result.

iv) Now equivalently the floating fee is equivalent to an option on (Fund – XYZ). As before, the mean of the underlying asset does not enter the calculation of BSM formula; The standard deviation now equals to:

sqrt(std\_fund^2 + std\_XYZ^2 -2\*corr\*std\_Fund\*std\_XYZ) = 17.08%

Use BSM formula again, the call option worth 8.29% per share

solve k \* 8.29% = 2% => k = 24.14%

v) HF manager in (i) is incentivized take a passive investment strategy (say holding cash and bond) to maintain positive return, since his payout is only proportional to positive return. HF manager in (ii) is incentivized to take a much more aggressive investment strategy since his payout is based on the fact that he has to beat the market benchmark.

2.

a) You can use options and stocks to hedge delta but long gamma. If the volatility is realized higher than what was priced at the time of portfolio setup, you will profit from the long gamma position.

b) During the derivation of BSM we can calculate the delta of the call option = 0.5262. Thus, to delta hedge, when you buy a call option contract you need to short 0.5262 shares of XXX stock.

c) Call option is priced at 14.3% implied vol which means its price = 1.2662;

put option is priced at 16.5% implied vol which means its price = 1.3573.

A portfolio of a long position in call option, a short position in put option and a long position in the present value of strike is 1.2662-1.3573+45\*exp(-0.23\*5.21%) = 44.3729 which is equivalent to longing one share of XXX with the underlying price 45.

A strategy to yield a sure profit long the portfolio and short XXX with the same amount.