ECE 383 Homework 13 Name:

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For this problem assume the following VHDL BRAM INIT values (just the 1st two lines are given) are used as a LUT in a DSS system to produce sine waves. The values are 16 bits wide and are Q16.0. Remember the 1st value at memory location 0 is in the upper right corner (i.e., 8000 hex). The values in the LUT are unsigned.

```
INIT_00 => X"8BC28AF98A31896988A087D8870F8647857E84B583EC8323825A819180C88000",
INIT_01 => X"9830976A96A595DF95199452938C92C591FE913790708FA98EE18E198D528C8A",
…
```

Assume the phase increment for this system is in Q8.4 format. At Time 0, the system is initialize to memory location 0 (or the **index.offset** = 00000000.0000), so the Output = Base = 8000

a. (10 points) If the phase increment is 5.625 (decimal), what is its binary value in Q8.4 format?

b. (10 points) At Time 2 (or two increments later), what does the **index.offset** become in decimal?

c. (8 points) At Time 1 (or one increment later), what does the **index.offset** become in binary Q8.4?

d. (8 points) At this Time 2, what **Base** value is output (assuming we are not interpolating) in Hex?

e. (8 points) At this Time 2, what **Base** value is output (assuming we are not interpolating) in decimal?

f. (8 points) At this Time 2, if we are interpolating using the **Output = Base + Offset*Delta** method, what are the two values in the BRAM LUT we are using to interpolate in between in hex?

g. (8 points) At this Time 2, if we are interpolating using the **Output = Base + Offset*Delta** method, what are the two values in the BRAM LUT we are using to interpolate in between in decimal?

h. (8 points) At this Time 2, if we are interpolating using the **Output = Base + Offset*Delta** method, what is the value of the **Offset** in decimal?

i. (8 points) At this Time 2, if we are interpolating using the **Output = Base + Offset*Delta** method, what is the value of the **Offset** in binary?

j. (8 points) At this Time 2, if we are interpolating using the **Output = Base + Offset*Delta** method, what is the value of the **Delta** in decimal?

k. (8 points) At this Time 2, if we are interpolating using the **Output = Base + Offset*Delta** method, what is the final **Output** value in decimal? (assume answer is truncated to an integer)

l. (8 points) At this Time 2, if we are interpolating using the **Output = Base + Offset*Delta** method, what is the final **Output** value in hex? (assume answer is truncated to an integer)