Final Exam

1a)

Image 1:

How many times each word appears

A: 6	6/20	= .3
B: 3	5/20	= .25
C: 3	3/20	= .15
D: 4	4/20	= .2
E: 2	2/20	= .1
20		

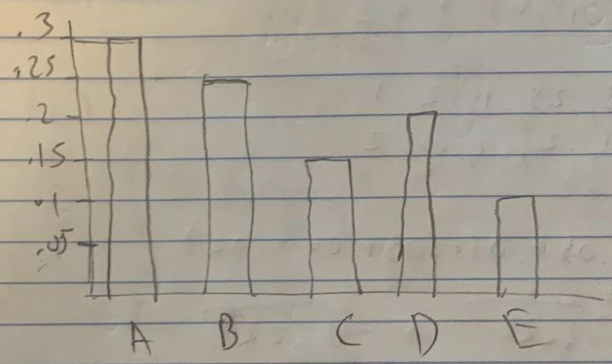
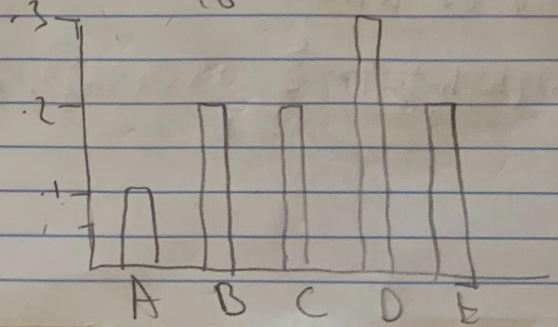


Image 2:

A: 1	1/10	= .1
B: 2	4/10	= .2
C: 2	2/10	= .2
D: 3	3/10	= .3
E: 2	2/10	= .2
10		



1a cont)

$$histint(h_i, h_j) = 1 - \sum_{m=1}^{k} \min(h_i(m), h_j(m))$$

$\min(.3, .1) = .1$
$\min(.25, .2) = .2$
$\min(.15, .2) = .15$
$\min(.2, .3) = .2$
$\min(.1, .2) = .1$

.85

$1 - .85 = \boxed{.25}$

↑ Similarity of both BOW using histogram intersection distance

1b) 5 feature (A, B, C, D, E)

4 bins for each feature

$5 \times 4 = 20$

Total bins: 20 bins

1c)

4 bins for each feature

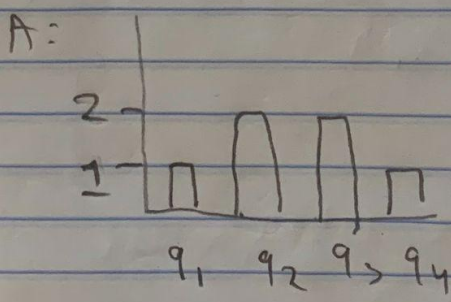
$5 \times 4 = 20$

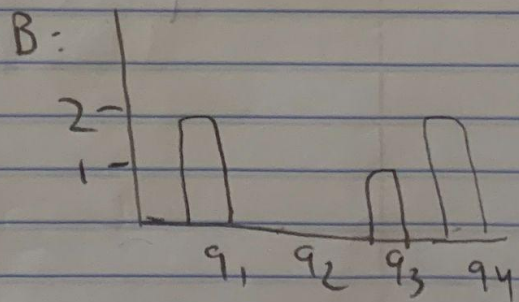
Total bins: 20 bins

1c)

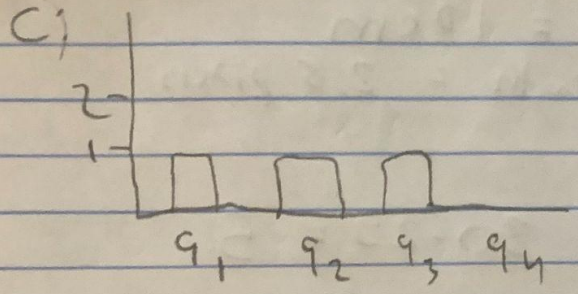
q_1 image A into 4 q_2

A: 1	E _ _ A	_ _ _ A	A: 2	E: 0	
B: 2	_ _ B _	_ A _ _	B: 0		
C: 1	D _ _ C	_ _ _ D	C: 1		
D: 1	_ _ _ B	_ _ C _	D: 1		
A: 2	_ A B _	_ _ _ B	A: 1	E: 1	
B: 1	_ _ _ _	_ _ _ _	D: 2		
C: 1	_ _ _ C	D _ _ E	C: 0	q_4	
D: 1	D _ A _	_ B _ A	D: 1		
E: 0					

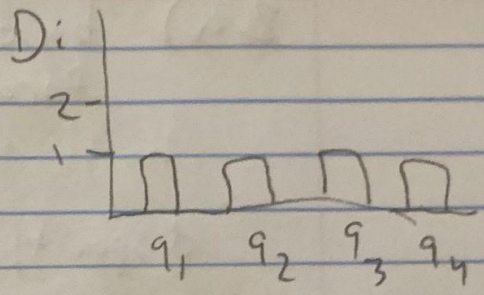




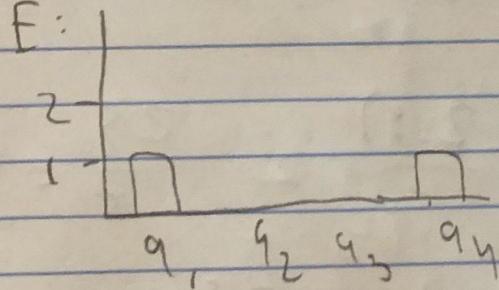
C:



D:



E:



2a) baseline = 10cm
focal length = 2.5 pixels

$\text{disparity}_1 = 30 - 25 = 5$

$\text{disparity}_2 = 30 - 28 = 2$

$$Z_1 = \frac{(10)(2.5)}{5} = \frac{25}{5} = 5$$

$$Z_2 = \frac{(10)(2.5)}{2} = \frac{25}{2} = 12.5$$

$$12.5 - 5 = 7.5$$

The depth difference between the 2 corresponding
is $\boxed{7.5}$

2b) They are the same the 3D euclidean

disparity$_2$ = 30 - 28 = 2

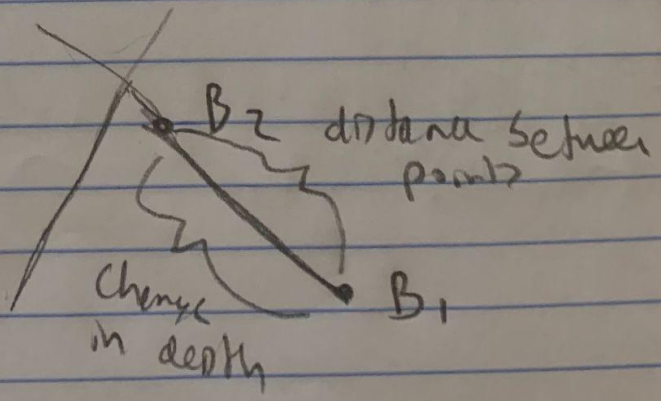
$$Z_1 = \frac{(10)(2.5)}{5} = \frac{25}{5} = 5$$

$$Z_2 = \frac{(10)(2.5)}{2} = \frac{25}{2} = 12.5$$

12.5 - 5 = 7.5

The depth difference between the 2 corresponding
is $\boxed{7.5}$

2b) They are the same the 3D Euclidean distance is the same thing as the difference in depth



3 a)

I = 1	I = 0	I = 2	I = 2
s = 1	s = 1+0 = 1	s = 1+2 = 3	s = 3+2 = 5
ii = 1	ii = 1	ii = 3	ii = 5
I = 2 s = 2 ii = 3	I = 1 s = 2+1 = 3 ii = 4	I = 2 s = 2+3 = 5 ii = 5+3 = 8	I = 1 s = 5+1 = 6 ii = 5+6 = 11
I = 1 s = 1 ii = 1+3 = 4	I = 3 s = 1+3 = 4 ii = 4+4 = 8	I = 2 s = 4+2 = 6 ii = 6+8 = 14	I = 1 s = 6+1 = 7 ii = 7+11 = 18
I = 2 s = 2 ii = 2+4 = 6	I = 2 s = 2+2 = 4 ii = 4+8 = 12	I = 1 s = 4+1 = 5 ii = 5+14 = 19	I = 3 s = 5+3 = 8 ii = 8+18 = 26

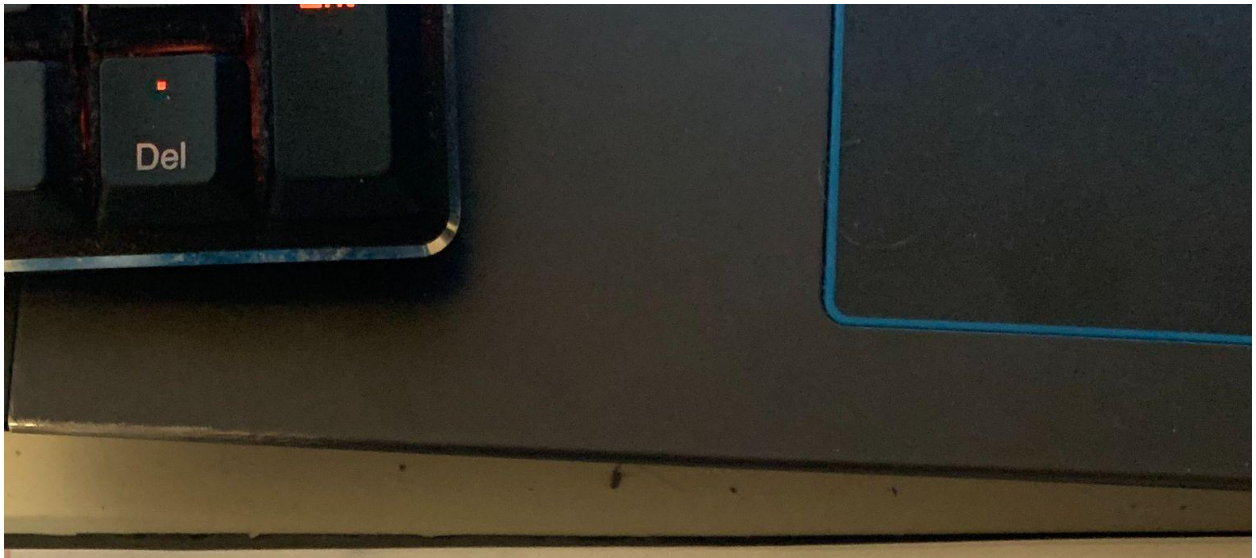
1	1	3	5
3	4	8	11
4	8	14	18
6	12	19	26

3 a)

I = 1	I = 0	I = 2	I = 2
s = 1	s = 1+0 = 1	s = 1+2 = 3	s = 3+2 = 5
ii = 1	ii = 1	ii = 3	ii = 5
I = 2 s = 2 ii = 3	I = 1 s = 2+1 = 3 ii = 4	I = 2 s = 2+3 = 5 ii = 5+3 = 8	I = 1 s = 5+1 = 6 ii = 5+6 = 11
I = 1 s = 1 ii = 1+3 = 4	I = 3 s = 1+3 = 4 ii = 4+4 = 8	I = 2 s = 4+2 = 6 ii = 6+8 = 14	I = 1 s = 6+1 = 7 ii = 7+11 = 18
I = 2 s = 2 ii = 2+4 = 6	I = 2 s = 2+2 = 4 ii = 4+8 = 12	I = 1 s = 4+1 = 5 ii = 5+14 = 19	I = 3 s = 5+3 = 8 ii = 8+18 = 26

1	1	3	5
3	4	8	11
4	8	14	18
6	12	19	26

b) The computational burden is reduced because you can use the answers from previous iterations in loop, in this case using the row sums (s) and the total sums above to get the new intensity. This makes it much faster to use integral images because they require much less operations (additions) to run.



6 a)

$$\frac{1}{1000} = .5^n$$

$$.001 = .5^n$$

$$n = 9.965$$

A minimum of 10 stages are needed to achieve a false positive rate less than 1 in 1000